Broadband and Mobility: The New Paradigm for Universal Service in the U.S.?[1]

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I. Introduction

Universal Service concepts have a long but changing history. Perhaps the first notion of universal telephone service in the United States was that advanced by the C.E.O. of AT&T, Theodore Vail, at the beginning of the twentieth century. Vail's notion of universal service was that the nation's inhabitants should be interconnected via the facilities of a single company – AT&T.[4] Given the historical growth of landline telecommunications infrastructure, the concept of interconnecting citizens had the practical effect of placing landline infrastructure to interconnect locations where citizens spent most of their time: homes and businesses. While the essence of virtually all universal service concepts is that customers (or citizens, potential customers) be interconnected to a communications network, ideas regarding the method of connection have changed over time.

Since 1997, the FCC has explicitly allowed voice universal service funding to be portable to other technologies.[5] In particular, this portability has meant that wireless

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[3] This paper has benefited greatly from the research and suggestions of James Bixby, primary editor *Washington University Journal of Law & Policy*, St. Louis, MO.

[4] *See, e.g.*, STUART BENJAMIN, DOUGLAS LICHTMAN, & HOWARD SHELANSKI, TELECOMMUNICATIONS LAW AND POLICY 614-620 (1st ed. 2001); Gerald Brock, *Historical Overview*, *in* HANDBOOK OF TELECOMMUNICATIONS ECONOMICS: STRUCTURE, REGULATION, AND COMPETITION 50-52 (M. Cave et al. eds., 2002).

[5] High Cost Universal Service Support, 73 Fed. Reg. 11580, Para. 2 (proposed Mar. 4, 2008)(to be codified at 47 C.F.R. §32, §36, §54)(*citing Federal-State Joint Board on Universal Service*, 62 Fed. Reg. 32862, Para. 46-48, 286-290, 311-13 (May 8, 1997)(hereinafter "First Report and Order")) (hereinafter "NPRM"); *See also* Alenco Comm., Inc. v. Fed. Comm. Comm'n, 201 F.3d 608, 621-

carriers may be eligible to receive universal service funding. In addition, the Federal-State Joint Board on Universal Service proposed that broadband internet connections be included in universal service support.[6] Clearly there is a new universal service paradigm in the U.S.

In section II below, I discuss the implications of three important recent regulatory documents. Section III, examines whether market intervention for universal service is economically rationale. This section describes network effects and considers whether they are likely sufficient to provide an economic rationale for market intervention. In section IV, I discuss those historical and public policy factors that I believe have favored land-line over mobile technologies, particularly in areas served by small wireline incumbent local exchange carriers (ILECs).

Section V considers the implications of the FCC eliminating the so-called "equal support" rule (the rule in which qualified providers in the same area receive the same funding regardless of technology and costs).

In section VI, I consider the characteristics of market and customers preferences that have pushed mobile services and broadband technologies into the universal service limelight. This includes a descriptive (non-econometric) examination of data illustrating market trends. Finally, section VII provides a summary and conclusions.

II. The Implications of Three Recent Regulatory Documents And The Farm Bill

Perhaps the most important regulatory decision regarding universal service in the United States was the FCC's First Report and Order in 1997.[7] The Commission, among other things, defined supported services,[8] identified carriers eligible for support,[9] described support for rural, insular and high cost areas,[10] and described support for low-income consumers.[11] With respect to the topics I treat in this paper, one of the critical

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22 (5th Cir. 2000) (" . . . portability is not only consistent with predictability, but also is dictated by the principles of competitive neutrality and the statutory command that universal service support be spent 'only for the provision, maintenance, and upgrading of facilities and services for which the [universal service] support is intended.'").

[6] High-Cost Universal Service Support; Federal-State Joint Board on Universal Service, 22 FCC Rcd 20477, at Para. 4 (Nov. 20, 2007).

[7] Federal-State Joint Board on Universal Service, CC Docket No. 96-45, Report and Order, 12 FCC Rcd 8776 (1997) (subsequent history omitted).

[8] *Id.* at section IV, Para. 56-107.

[9] *Id*. at section VI, Para. 127-198.

[10] *Id*. at section VII, Para. 199-325.

[11] *Id*. at section VIII, Para. 326-409.

aspects of the FCC's First Report and Order was a finding that universal service support was portable to carriers other than the incumbent local exchange carrier.[12]

2.1 The Recent Joint Board Recommendation and FCC's NPRM and Order

The FCC has already acknowledged the changing nature of concepts of universal service in the United States,[13] recognizing that both broadband service and wireless service now provide the type of communications services and benefits which the Universal Service Fund was designed to promote.[14] The potential for significant changes in universal service concepts in the U.S. have arisen in the last six months.

2.2 Joint Board Recommendation

On November 20, 2007, the FCC released the recommended decision of the federal state joint board (JB) on universal service.[15] One of the most important dimensions of the recommendation was:

> The Joint Board now recommends that the nation's communications goals include achieving universal availability of mobility services (defined as wireless voice), universal availability of broadband Internet services, and voice services at affordable and comparable rates for all rural and non-rural areas.[16]

The JB also recommended that: 1) three separate funds be established;[17] 2) funding be capped at current levels;[18] 3) the process should avoid funding competition or building duplicate networks;[19] 4) the "identical support" for wireless carriers at levels for land-line carriers be eliminated;[20] and 5) reverse auctions may offer advantages.[21]

2.3 FCC NPRM

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[12] *See also* High-Cost Universal Service Support; Federal-State Joint Board on Universal Service, 22 FCC Rcd 20477, at Para. 2 (Nov. 20, 2007)(internal citations omitted).

[13] High-Cost Universal Service Support: Federal-State Joint Board on Universal Service, 73 Fed. Reg. 11587, Para. 55 (Jan. 29, 2008).

[14] *See Id*. at Para. 29 & 56-67(stating that broadband and wireless communications technologies are now essential for education, public health, public safety, and economic development of the country).

[15] High-Cost Universal Service Support; Federal-State Joint Board on Universal Service, 22 FCC Rcd 20477 (Nov. 20, 2007).

[16] *Id.* at Para. 4.

[17] *Id*. at Para. 1.

[18] *Id*. at Para.2.

[19] *Id*. at Para.3.

[20] *Id*. at Para.5.

[21] *Id*. at Para.6.

On January 29, 2008, the FCC released its Notice of Proposed Rulemaking providing tentative conclusions and seeking comment on many issues.[22] The focus of the NPRM was to the JB's recommendation that identical support rule be eliminated, and discussing and seeking comment on the methods by which the costs of CETCs might be calculated, and whether the funding to CETCs should be capped.[23] The FCC did later vote to temporarily cap the Universal Service fund for competitive eligible telecommunications carrriers (CETCs).[24]

The NPRM itself was noticeable silent on whether: three separate funds should be established; the process should avoid funding competition or duplicate facilities; or reverse auctions should be employed.[25]

The NPRM itself was also silent on whether broadband internet access should be included as part of universal service at this time.[26] "While the USF's High Cost Program does not *explicitly* fund broadband infrastructure, subsidies are used, in many cases, to upgrade existing telephone networks so that they are capable of delivering high-speed services."[27] And while the NPRM itself was silent on the issue of explicitly funding broadband internet access the concept is gaining traction; for example "[l]egislation

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[22] NPRM.

[23] *See, e.g., Id*. at Para.1.

[24] High Cost Universal Service Support: Order, Docket 96-45 (May 1, 2008)(Federal Register citation forthcoming, currently available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-122A1.pdf). *See, e.g.*, John Dunbar & Dibya Sarkar, *Federal Regulators Cap Cell Phone Company Payments*, BOSTON GLOBE, May 1, 2008, *available at* http://www.boston.com/business/technology/articles/2008/05/01/federal_regulators_cap_cell_phone_company_payments/.

[25] The statement of Chairman Martin reflects his continued belief in the long term viability of reverse auctions. NPRM(statement of Chairman Martin), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-22A2.pdf. Peculiarly, the statement of Commissioner Copps includes "I must dissent from the NPRM's tentative conclusion that the Commission should develop an auction mechanism to determine high-cost support." NPRM(statement of Commissioner Copps), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-22A3.pdf). And the statement by Commissioner Adelstein includes "To that end, I am also concerned about the impact of reverse auctions and whether such mechanisms can provide adequate incentives for build out in Rural America." NPRM(statement of Commissioner Adelstein), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-22A4.pdf. These must be based on their reading of a draft of the NPRM rather than the final NPRM itself.

[26] Broadband is discussed in the statements of Commissioners Adelstein and Copps. It appears, as with reverse auctions, that Commissioner Adelstein's statement "So, the decision to embrace broadband, through the list of supported services and through targeted funding for unserved areas …" is based upon a reading of a draft of the NPRM, rather than the NPRM itself. NPRM(statement of Commissioner Adelstein), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-22A4.pdf.

[27] LENNARD G. KRUGER & ANGELE E. GILROY, CONGRESSIONAL RESEARCH SERVICE, BROADBAND INTERNET ACCESS AND THE DIGITAL DIVIDE: FEDERAL ASSISTANCE PROGRAMS 11 (2008), *available at* http://www.nationalaglawcenter.org/assets/crs/RL30719.pdf.

introduced in the 110th Congress seeks to provide federal financial assistance for broadband deployment in the form of grants, loans, subsidies, and tax credits."[28]

In the NPRM, the FCC did not specifically endorse mobility as a new part of universal service, and it did not specifically endorse three or (in the absence of funding broadband internet access) two universal service funds. However, the FCC has already clearly decided that universal service support is portable, and available to all eligible telecommunications carriers (ETCs) regardless of the technology used.[29] Indeed, pressures for changes to the universal service funding are largely due to growing funding of wireless CETCs.[30] Therefore, current universal service funding largely reflects traditional land-line connections and wireless voice connections.

2.4 FCC Order of an Interim Cap for CETCs

In May 2007, the Federal-State Joint Board on Universal Service recommended an interim cap on USF payments to CETCs.[31] In keeping with this recommendation, the FCC ordered that "total annual competitive ETC support for each state will be capped at the level of support that competitive ETCs in that state were eligible to receive during March 2008 on an annualized basis."[32] The FCC provided for two exemptions to the cap: 1) for CETCs "to the extent it files cost data demonstrating that its costs meet the support threshold in the same manner as the incumbent local exchange carrier (LEC)"; and 2) "for competitive ETCs serving tribal lands or Alaska Native regions."[33]

2.5 Farm Bill With Loan Program For Broadband

"A day after overwhelming passage in the House, the Senate voted Thursday 81-15 for the five-year, $289 billion farm bill that includes a loan program to bring broadband services to rural areas. The vote in both chambers exceeds the two-thirds majority required to survive a presidential veto …"[34]

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[28] *Id*. at Introduction.

[29] NPRM at Para. 2(internal citations omitted).

[30] *See, e.g.*, NPRM at Para. 4 (fn 14) and Para. 9 (fn 26)(*citing* FCC, UNIVERSAL SERVICE MONITORING REPORT 2006 41, Tbl. 3.2 (2006); Letter from Jeffrey A. Eisenach, Chairman, Criterion Economics, LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission, CC Docket No. 96-45, WC Docket No. 05-337, Attach. The Effects of Providing Universal Service Subsidies to Wireless Carriers at 16-18, App. B (filed June 13, 2007), *available at http://search.ssrn.com/sol3/papers.cfm?abstract_id=993621*(claiming that, in 2006, 68 percent – 192 out of 281 – of all competitive ETC service areas were wireless service areas, and that 94 percent – $770.5 million out of $820.5 million – of all competitive ETC support went to wireless competitive ETCs).

[31] *See High-Cost Universal Service Support; Federal-State Joint Board on Universal Service*, 22 FCC Rcd 8998 (2007).

[32] High Cost Universal Service Support: Order, Docket 96-45, at Para. 1 (May 1, 2008)(Federal Register citation forthcoming, currently available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-122A1.pdf).

[33] *Id.*

[34] Telecom AM, May 16, 2008, Vol. 14, No. 96. See also, U.S. News and World Report, **Congress's**

III. Is Market Intervention for Universal Service Economically Rationale?

3.1 The Test for Market Intervention

The value of relying on competitive markets (or effectively competitive markets as a practical matter) is well known in economics.[35] Governments should only interfere in the workings of markets when a two-part test has been passed. First, the freely functioning market has failed to produce the results that would be superior for society (i.e., that market results would be welfare inferior to intervention). Second, the benefits of market intervention are greater than the costs of intervention; i.e., the evaluation of the potential superiority of intervention reflect both the direct costs of regulation/intervention and the indirect costs of any market distortions resulting from regulation/intervention.[36] This two part test is germane for both an antitrust remedy as well as for the imposition of regulation on a market.

3.2 Network Effects, a Rationale for Market Intervention?

For telecommunications, and for universal service in telecommunications in particular, what market characteristics may provide a rationale for government intervention? It is well known in telecommunications economics and the economics of networks, that the demand for telecommunications services is different from the demand for traditional products and services like groceries, automobiles, or dry cleaning. A telecommunications customer's demand will depend, in part, on factors that are external to the customer's decision to purchase.[37] There are generally considered to be two types of telecommunications positive externalities (also called, or closely related to, direct

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Farm Bill Looks Vetoproof, Posted May 15, 2008, *available at* http://www.usnews.com/articles/news/national/2008/05/15/congresss-farm-bill-looks-vetoproof.html; and USTelecom Daily Lead SmartBrief, Rural Broadband Funds Make it into farm bill, *available at* http://www.smartbrief.com/news/ustelecom/storyDetails.jsp?issueid=D91026FC-BA1A-49B6-B009-0072BE38D79A&copyid=5D4CE5D1-7C35-4562-BAE5-64B84847872E&brief=ustelecom&sb_code=rss&&campaign=rss

[35] *See generally*, virtually any textbook on the principles of economics, microeconomics or price theory, or industrial organization.

[36] *See, e.g.*, CHARLES WOLFE, MARKETS OR GOVERNMENTS: CHOOSING BETWEEN IMPERFECT ALTERNATIVES (1988). *See also* Ronald Coase, *The Problem of Social Costs*, 3 J. OF L. & ECON. 1-44 (1960) ("The Pigovian analysis shows us that it is possible to conceive of better worlds than the one in which we live. But the problem is to devise practical arrangements which will correct defects in one part of the system without causing more serious harm in other parts.")

[37] An externality is a circumstance in which the action of one economic agent causes costs (negative externality) or benefits (positive externality) for other economic agents. Pollution is an example of a negative externality; the polluter causes costs for other others, and without government intervention, these costs are not considered by the polluter (i.e., not included in the polluters decision process).

network effects, or bandwagon effects).[38] These are: 1) network externalities (where the value of network subscription increases with the number of subscribers on a network or a set of interconnected networks); and 2) call externalities, or use externalities[39] (which recognize that, for most calls, one party obtains value from the call, but generally does not pay for the call). It is also useful to recognize that the value of subscription is derived from the value customers expect to obtain from the calls they will make.[40]

A direct network effect (or network externality) occurs when one customer's subscription to the network, leads to value obtained from other subscribers on the network.[41] Examples of direct network effects include voice telephony, fax machines, and email accounts. Indeed, direct network effects create a strong incentive for network providers to be interconnected (since network effects span individual providers) and a potential rationale for government intervention to insure interconnection on reasonable terms between network providers.

Moreover, the existence of a direct network effect will likely cause there to be a

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[38] *See generally* Stanly Liebowitz & Stephen Margolis, *Network Effects, in* HANDBOOK OF TELECOMMUNICATIONS ECONOMICS: STRUCTURE, REGULATION, AND COMPETITION 76 (Cave et. al. eds., 2002); Jeffrey Rohlfs, *Bandwagon Effects in Telecommunications, in* HANDBOOK OF TELECOMMUNICATIONS ECONOMICS: VOL. 2, 81 (S. K. Majumdar et al, eds, 2005); JEFFREY ROHLFS, BANDWAGON EFFECTS IN HIGH TECHNOLOGY INDUSTRIES (MIT Press 2001); HAL VARIAN, JOSEPH FARRELL, & CARL SHAPIRO, THE ECONOMICS OF INFORMATION TECHNOLOGY, (Cambridge U. Press 2004). *See also*, http://en.wikipedia.org/wiki/Network_effect.

[39] *See, e.g.,* Jeffry Rohlfs, *A Theory of Interdependent Demand for a Communications Service* 5 BELL J. OF ECON. & MGMT. SCI. 16 (1974); Ingo Vogelsang & Bridger Mitchell, TELECOMMUNICATIONS COMPETITION: THE LAST TEN MILES 51 (MIT Press 1997); HARALD GRUBER, THE ECONOMICS OF MOBILE TELECOMMUNICATIONS 191 (Cambridge U. Press 2005); LESTER TAYLOR, TELECOMMUNICATIONS DEMAND IN THEORY AND PRACTICE 9 (Kluwer Academic Publishers 1994)("This is the first of two demand externalities associated with the telephone, and is usually referred to as the call (or use) externality."); JOHN WENDERS, THE ECONOMICS OF TELECOMMUNICATIONS 29 (Ballinger 1987)("Finally, back to telephones. There are two possible sources of externalities here – call externalities or network externalities. Call externalities may result from the fact that both parties [of the call] may benefit from the placement of phone call even though the cost usually falls entirely on the caller. One of the ways in which call externalities are revealed is by the value placed on telephone access [subscribership] to receive calls.").

[40] *See, e.g.,* Lyn Squire, *Some Aspects of Optimal Pricing for Telecommunications,* 4 BELL J. OF ECON. & MGMT. SCI. 515 (1973); John Wenders, THE ECONOMICS OF TELECOMMUNICATIONS 29, 46-53 (Ballinger 1987); Lester Taylor, TELECOMMUNICATIONS DEMAND IN THEORY AND PRACTICE 28-31, 83 (Kluwer Academic Publishers 1994)("As always, **usage drives access**, and types of access and usage drives customer-premises equipment.") (emphasis in the original).

[41] An indirect network effect is one in which two or more products in a "system" are strong complements. Consider the example of DVD players and DVDs; customers do not directly obtain value from others owning a DVD player, but rather benefit indirectly from the greater choice of DVDs that exist with a large number of customers owning DVD players. *See, e.g.*, JEFFREY ROHLFS, BANDWAGON EFFECTS IN HIGH TECHNOLOGY INDUSTRIES (MIT Press 2001); HAL VARIAN, JOSEPH FARRELL, & CARL SHAPIRO, THE ECONOMICS OF INFORMATION TECHNOLOGY, (Cambridge U. Press 2004). The text by Varian, et. al, provides a very intuitive, non-technical treatment of the topic of direct and indirect network effects. Indeed, this is a required text I use to teach these topics to masters students in engineering (with no economics prerequisites) in my course on the Economics of Technology.

critical mass of customers.[42]

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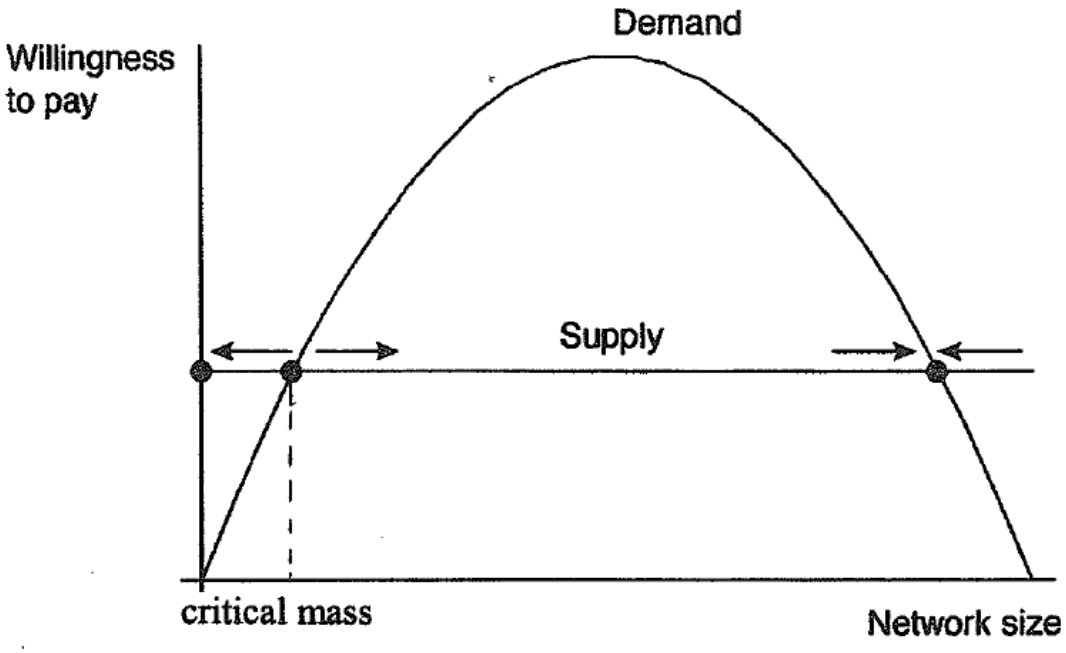

Figure 3 Demand and supply for a network good

Beyond the critical mass of customers, the market will be sufficient and self sustainable. However, if the market fails to reach critical mass, there are significant potential welfare gains (potential consumer surplus plus potential producer rents) that are not obtained. The potential failure to reach critical mass in the presence of a direct network effect would be a strong potential rationale for government intervention, to achieve critical mass. Those who understand direct network effects and the U.S. voice telecommunications market will know that critical mass has long ago been surpassed.[43] Therefore, the potential failure to reach critical mass is not a viable rationale for universal service policies for voice communications in the United States.

The existence of a direct network effect can still provide a potential rationale (albeit a weaker rationale) for a universal service policy for U.S. voice telecommunications, even having surpassed the critical mass. This is because the marginal network subscriber may receive value of subscription below the price/cost of subscription, but the external

[42] *See, e.g.*, HAL VARIAN, JOSEPH FARRELL, AND CARL SHAPIRO, THE ECONOMICS OF INFORMATION TECHNOLOGY, (Cambridge U. Press, 2004); http://en.wikipedia.org/wiki/Network_effect. The graph here is a slight modification to the one at page 35.

[43] Indeed, Jeffrey Rohlfs has argued that AT&T originally employed a very poor market strategy that was largely counter to the concept of direct network effects and critical mass. JEFFREY ROHLFS, BANDWAGON EFFECTS IN HIGH TECHNOLOGY INDUSTRIES (MIT Press 2001). However, despite its ineptitude in this regard, AT&T still managed to achieve critical mass.

benefit from others on the network of adding the marginal subscriber creates a total societal value of the network subscriber (including the external benefit) that is greater than the price/cost of subscription. Moreover, to the extent that the marginal cost of adding subscribers is below the marginal subscription price, the economic rationale becomes stronger for government intervention.[44]

Large network providers should also have some incentive to consider direct network effects; i.e., they should attempt to internalize their own customer's externalities in pricing.[45] This could come in the form of low or negative margins on subscription prices and handsets (for mobile providers) and higher margins for vertical features and usage. This could also take the form of price discrimination (to attract low demand elasticity subscribers). To the extent that a provider attracts a community of interest (a group that tends to call each other), the incentive for the provider to internalize the network externality is stronger.

As total networks penetration reaches very high levels, the network externality (the value to existing subscribers) of adding an additional subscriber tends to be relatively low. Telepohone penetration in the U.S. had peaked by about 2002 at approximately 96%.[46] Given that a relatively small proportion of households have no phone service, there may be greater value in encouraging additional mobile subscription to allow individuals to be connected for a higher proportion of time (and across a greater geographic space). However, even mobile subscription in the U.S. is relatively high at 84%.[47]

Unfortunately, there is not a well developed literature measuring the network externality. A very old study found that the external benefit from adding a marginal subscriber was only about $3/month.[48]

Also, the current literature suggests that the cost of adding a marginal customer to the network by simply keeping subscription prices low to all customers, is exceptionally high. One study found that the cost is over $20,000 to add a marginal customer with generically low prices for all subscribers.[49] In contrast means-based mechanisms (Life-

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[44] The relevant comparison would be the marginal cost of adding a subscriber vis-à-vis the $\sum$ value of subscription to adding the last subscriber (across all subscribers *n*).

[45] The externality is external to the customer making the subscription decision, not necessarily the network provider.

[46] FCC, TELEPHONE PENETRATION BY INCOME BY STATE: DATA THROUGH MARCH 2007, rel March 2008, [hereinafter FCC 2008 PENETRATION REPORT] chart 1.

[47] Cellular Telephone & Internet Association, Wireless Quick Facts, http://www.ctia.org/content/index.cfm/AID/10323 (last visited May 14, 2008) (listed as of December 2007).

[48] Lewis Perl, Residential Demand for Telephone Service (1983)(unpublished manuscript, on file with National Economic Research Associates (NERA)). Given the vintage of this study, a current study would reflect an inflation adjustment, causing the value to be higher, but would also reflect a lower value due to higher penetration rates.

[49] Christopher Garbacz & Herbert Thompson, *Estimating Telephone Demand with State Decennial Census Data from 1970-1990: Update with 2000 Data*, 24 J. OF REG. ECON. 373, 377 (2003) ("The

Line and Link-up programs at the federal level) are much more effective; in economic parlance, these programs utilize price discrimination to attract the customer segment that is likely to be much more price sensitive and would otherwise be less likely to have subscribed (without assistance). [50]

3.3 Non Means-Based Mechanisms for Voice Communications Fail the Test

Telecommunications/network economics, under the right circumstances, provides a theoretical rationale for market intervention to promote universal service (i.e., to induce additional subscribers to join the network). However, given the maturity of the U.S. telecommunications network (and the fact that the network has long ago surpassed the required critical mass) and the small proportion of customer's without service, the potential justification is weak. Moreover, the empirical literature suggests that the costs of adding subscribers via non means-based universal service mechanisms is far higher than the benefits of adding those subscribers. Therefore, non means-based universal service mechanisms for voice communication in the U.S. fail the test for justifying market intervention; i.e., the evidence suggests that the costs are far higher than the benefits.

My research is not sufficient to provide a conclusion with regards to potential subsidies for broad-band subscription. I raise five points to contemplate when evaluating broadband. First, the internet and independently broadband technologies have also obviously passed critical mass. Second, by any measure, broadband subscription is currently much lower than telephone subscription; this means that there is likely greater potential for higher marginal value of adding subscribers (vis-à-vis voice telephony). Third, the relevant direct network effect that is most obvious is for email addresses; but email use has relatively low bandwidth requirements. Fourth, since the demand for any network subscription is derived from the value of usage, higher band-width uses certainly could contribute to higher values of subscription; and perhaps some other form of a network effect (e.g., subscription in order to share large files).

Fifth, given the lower rates of penetration of broadband (vis-à-vis voice telephony), especially in rural areas, there may be an economic development rationale for subsidies. That is, the existence of broadband may attract higher-valued businesses (including those relying more on small office/home office (SOHO) arrangements.[51] This may be

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subsidy per year per added household would be about $20,570 (1999 dollars) [with an untargeted 10% reduction in monthly price].")

[50] *See, e.g., id*, and FCC 2008 PENETRATION REPORT ("On average, for low-income households in those states where full or high assistance is provided, telephone penetration increased by 3.2%, between March 1997 and March 2007." At page 5; *see also* table 1)

[51] *See, e.g.*, Washington State University, Center to Bridge the Digital Divide, Rural Bridges Projects, http://cbdd.wsu.edu/projects/rural/ruralbridges/projects.html#eda (last visited May 4, 2008); Northwest Open Access Network, NoaNet Services, http://www.noanet.net/overview/ (last visited May 4, 2008).

important for local jurisdictions competing for residents and businesses.[52] For example, a June 2007 study found that for every one percentage point increase in broadband penetration in a state, employment is projected to increase by 0.2 to 0.3% per year.[53] The International Telecommunications Union lists the U.S. as ranking only 18th in broadband penetration among countries in the world (as of December 2006).[54] There are also likely savings in fuel, opportunity cost of travel time, and pollution reductions from expanded broadband connectivity.

3.4 A Rationale for Rural Subsidization?

Network effects provide the primary potential economic rationale for subsidization of network subscription. However, non means-based subsidization of voice communications apparently fails the benefit/cost test for government intervention. Is there an alternate rationale to provide subsidies to rural voice telecommunications or broadband services?

If there is a significant difference in the demand elasticity for the group of potential rural subscribers, this could, at least theoretically, provide some basis for an economic rationale for rural subsidies. The reason for the relative effectiveness of targeted means-based voice telecommunications subsidies (vis-à-vis non means-based subsidies) is that they represent a form of price discrimination, focusing on a relatively price-sensitive group (low income consumers). It is indeed logical to expect that as a group low-income consumers are more price sensitive for virtually any good or service, including subscription to a voice telecommunications network.[55] However, I am not aware of research that suggests that rural America has significantly higher own-price elasticity of demand for voice or broadband subscription.

I can't comment in any comprehensive way regarding any non-economic rationales for subsidizing rural voice communications or broadband. I do offer comments for contemplation.

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52 Much of the potential gains to one community are likely losses to another community, as jurisdictions compete for such residents; these transfers should, therefore, be irrelevant to national policy.

53 Crandall, Robert, William Lehr, and Robert Litan, *The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data*, June 2007, 20 pp. Available at [http://www3.brookings.edu/views/papers/crandall/200706litan.pdf].

54 International Telecommunications Union, *Economies by broadband penetration, 2006.*

Available at [http://www.itu.int/ITU-D/ict/statistics/at_glance/top20_broad_2006.html].

55 I use the term "elasticity" of demand to refer to the price responsiveness of the group, since for any individual consumer network subscription can be considered a binary choice: they either subscribe to the network or they do not. One can model the choice by any member of the group as a probability of subscription (dependent on, for example, demographic characteristics such as income). However as a group, one may still discuss demand elasticity. The higher the own-price elasticity of demand for network subscription for a group means that any form of a subsidy that has the effect of reducing the price paid by consumers of that group, the more likely it is to lead to the addition of a network subscriber; to induce someone within that group to subscribe to voice telecommunications service, who would otherwise not have subscribed.

The prices of some goods and services do vary across urban/rural categories. Housing and land prices, for example, are obviously much higher in urban areas. Means-based subsidies for housing do exist, but I am not aware of any non means-based subsidies. Like housing subsidies, subsidies to rural telecommunications and broadband services are likely to be more effective if they are means-based, if one believes that additional subsidies are warranted (beyond the existing means-based subsidies for voice telephony).

3.5 It is Critical to Avoid Distorting the Competitive Process

For any government intervention in a market, it is important to avoid distorting the competitive process in ways other than the changes/distortions were intended. This is particularly important in this instance, since the rationale for market intervention is weak. Therefore, it is absolutely critical for the The FCC and state commissions to avoid any measures that distort the competitive process in its methods of generating revenues for, and providing subsidies to, telecommunications and broadband services.

I applaud the FCC for previously establishing competitive neutrality as an additional principle for universal service.[56] Competitive neutrality must include the concept that universal service neither disadvantages one technology over another, nor one particular service provider over another.

The Rural Task Force noted eight years ago, "Section 254(b) and 214(e) of the 1996 Act provide the statutory framework for a system that encourages competition while preserving and advancing universal service."[57] The FCC recognized this statutory mandate in 1997, when it stated that "universal service mechanisms and rules" should "neither unfairly advantage nor disadvantage one provider over another, and neither unfairly favor nor disfavor one technology or another."[58]

The United States Court of Appeals for the Fifth Circuit, in *Alenco Communications, Inc. v. FCC*, found that the universal service "program must treat all market participants equally – for example, subsidies must be portable – so that the market, and not local or federal regulators, determines who shall compete for and deliver services to customers."[59] The Fifth Circuit noted that non-discriminatory access by to high-cost support, by incumbent and competitor alike "is made necessary not only by the realities of competitive markets but also by statute."[60] And that "[t]he FCC must see to it that *both* universal service and local competition are realized; one cannot be sacrificed in favor of the other."[61]

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[56] NPRM at n. 3.

[57] Rural Task Force, *White Paper 5: Competition and Universal Service*, at 8 (2000), *available at* http://www.wutc.wa.gov/rtf) (hereinafter "White Paper 5").

[58] *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Report and Order, 12 FCC Rcd 8776, 8801 Para. 47 (1997) (subsequent history omitted)

[59] Alenco Commun. v. Fed. Comm. Comm'n, 201 F.3d 608, 616 (5th Cir. 2001).

[60] *Id.*

[61] *Id.* at 614 (emphasis in original).

IV. U.S. History and Past Policies Have Favored Land-Line over Mobile Technology

Several characteristics of U.S. history, and U.S. regulatory policy, have favored land-line technology over mobile technology.

4.1 Previously, mobile providers could not obtain high cost funding.

Prior to the Telecommunications Act of 1996, only incumbent land-line local exchange carriers could receive high cost universal service funding. While this asymmetry was, at least in theory,[62] eliminated by the FCC's implementation of the Act, the historical bias will clearly have effects today. It is likely that there are some rural areas for which a wireless technology would have been the least-cost technology. As such, rational public policy would have been to have a wireless provider be the incumbent provider in that jurisdiction. Land-line providers obviously now have the advantage of having received high cost funding for some period of time already.

4.2 Wireless providers do not receive land-line switched access charges

Originating and terminating switched access charges are still, on average, greater than the marginal cost of originating and terminating calls. Indeed, the so-called carrier common line charge is by its name and its very nature designed to recover a portion of the non-traffic sensitive loop costs. While federal switched access charges have declined over time, state-based rates are often still high. In particular, these rates are high for smaller rural land-line providers. For example, the table below shows the rates in my former state of residence, Missouri.[63] Note that that even counting the large carriers (e.g., AT&T), 36 of the 43 phone companies have average (averaged across interLATA and intraLATA rates) switched access rates per conversation minute of $.1388 or higher.

[62] I do not treat here the issue of the difficulty wireless providers may have in obtaining CETC status in some jurisdictions.

[63] MISSOURI PUB. SERV. COMM'N, ILEC SWITCHED ACCESS RATES (2006), *available at* http://www.psc.mo.gov/telecommunications/consumer-information/telecommunications-service-provider-information/access.pdf.

Current Status — SWITCHED ACCESS RATE COMPARISON of INCUMBENT LOCAL EXCHANGE CARRIERS (ILECs)

*Sorted by Average Access Charges** — *All figures in USA Dollars*

Average Access Rank	Telephone Company	Carrier Common Line (CCL) INTERLATA Originate	INTERLATA Terminate	INTRALATA Orig.(P)	INTRALATA Orig.(d)	INTRALATA Term.(P)	INTRALATA Term.(d)	Local Switching LS2	Line Termn. LT	Transport Termn. TT	FGC&D Local Transport	TOTALS Inter-LATA	TOTALS Intra-LATA	Average Access Charges*
1	Miller Telephone	0.0986	0.1690	0.0400	0.0017	0.0686	0.0029	0.0118	0.0149		0.0124	0.3458	0.1868	0.2663
2	Peace Valley Telephone	0.0530	0.1052	0.0530		0.1052		0.0118	0.0149		0.0241	0.2598	0.2598	0.2598
3	Northeast Missouri Rural Telephone	0.0574	0.1034	0.0574		0.1034		0.0118	0.0149		0.0189	0.2520	0.2520	0.2520
4	Mid-Missouri Telephone	0.0708	0.0958	0.0407		0.0697		0.0118	0.0149		0.0281	0.2762	0.2200	0.2481
5	Grand River Mutual Telephone	0.0682	0.1170	0.0418	0.0064	0.0717	0.0110	0.0118	0.0149		0.0221	0.2828	0.2111	0.2469
6	Ellington Telephone	0.0380	0.0652	0.0610	0.0369	0.1045	0.0632	0.0118	0.0149		0.0273	0.2112	0.2735	0.2424
7	MoKan Dial	0.0842	0.1443	0.0332	0.0007	0.0569	0.0012	0.0118	0.0149		0.0112	0.3043	0.1659	0.2351
8	Fidelity Telephone	0.0450	0.0450	0.0450		0.0450		0.0194			0.0457	0.2203	0.2203	0.2203
9	Stoutland [TDS] Telephone	0.0500	0.1538	0.0239		0.0407		0.0118	0.0149		0.0126	0.2824	0.1432	0.2128
10	Holway Telephone	0.0425	0.0820	0.0425		0.0820		0.0118	0.0149		0.0153	0.2085	0.2085	0.2085
11	KLM Telephone	0.0446	0.0745	0.0446		0.0745		0.0118	0.0149		0.0155	0.2035	0.2035	0.2035
12	Citizens Telephone	0.0445	0.0757	0.0445		0.0757		0.0268			0.0115	0.1967	0.1967	0.1967
13	BPS Telephone	0.0262	0.0626	0.0262		0.0626		0.0282		0.0049	0.0133	0.1916	0.1916	0.1916
14	Steeltville Telephone	0.0197	0.0698	0.0197		0.0698		0.0369			0.0140	0.1913	0.1913	0.1913
15	Windstream Missouri	0.0489	0.0880	0.0237		0.0427		0.0267			0.0167	0.2236	0.1530	0.1883
16	CenturyTel [Spectra]	0.0285	0.0592	0.0285		0.0592		0.0269		0.0047	0.0127	0.1856	0.1856	0.1856
17	Choctaw Telephone	0.0597	0.1022	0.0317	0.0074	0.0543	0.0127	0.0118	0.0149		0.0035	0.2223	0.1464	0.1844
18	Oregon Farmers Mutual Telephone	0.0391	0.0692	0.0391		0.0692		0.0118	0.0149		0.0107	0.1830	0.1830	0.1830
19	Mark Twain Rural Telephone	0.0492	0.0842	0.0329	0.0144	0.0584	0.0246	0.0118	0.0149		0.0139	0.1949	0.1705	0.1827
20	Farber Telephone	0.0335	0.0574	0.0263	0.0202	0.0451	0.0346	0.0118	0.0149		0.0226	0.1895	0.1700	0.1798
21	Iowa Telecom	0.0251	0.0600	0.0251		0.0600		0.0282	0.0049		0.0133	0.1779	0.1779	0.1779
22	Chariton Valley Telephone	0.0440	0.0754	0.0322	0.0180	0.0552	0.0309	0.0118	0.0149		0.0104	0.1936	0.1616	0.1776
23	Cass County Telephone	0.0299	0.0446	0.0299		0.0446		0.0282		0.0049	0.0133	0.1771	0.1771	0.1771
24	Orchard Farm [TDS] Telephone	0.0468	0.0802	0.0361	0.0269	0.0619	0.0461	0.0118	0.0149		0.0046	0.1896	0.1606	0.1751
25	New Florence Telephone	0.0208	0.0357	0.0393	0.0250	0.0675	0.0429	0.0118	0.0149		0.0192	0.1483	0.1986	0.1735
26	Embarq Missouri	0.0329	0.0496	0.0329		0.0496		0.0236			0.0180	0.1657	0.1657	0.1657
27	CenturyTel of Missouri	0.0200	0.0477	0.0200		0.0477		0.0268		0.0047	0.0127	0.1654	0.1654	0.1654
28	Granby Telephone	0.0317	0.0543	0.0350	0.0229	0.0600	0.0392	0.0118	0.0149		0.0106	0.1606	0.1696	0.1651
29	Le-Ru Telephone	0.0267	0.0457	0.0267		0.0457		0.0271			0.0191	0.1648	0.1648	0.1648
30	Kingdom Telephone	0.0384	0.0659	0.0247	0.0038	0.0422	0.0065	0.0118	0.0149		0.0115	0.1807	0.1433	0.1620
31	IAMO Telephone	0.0254	0.0553	0.0254		0.0553		0.0118	0.0149		0.0137	0.1614	0.1614	0.1614
32	McDonald County Telephone	0.0267	0.0459	0.0267		0.0459		0.0270			0.0143	0.1551	0.1551	0.1551
33	Craw-Kan Telephone	0.0347	0.0595	0.0216	0.0017	0.0371	0.0029	0.0118	0.0149		0.0081	0.1638	0.1283	0.1460
34	Alma Telephone	0.0302	0.0518	0.0145	0.0024	0.0249	0.0041	0.0118	0.0149		0.0137	0.1628	0.1202	0.1415
35	New London [TDS] Telephone	0.0394	0.0675	0.0100		0.0100		0.0118	0.0149		0.0115	0.1833	0.0964	0.1399
36	Green Hills Telephone	0.0147	0.0507	0.0147		0.0507		0.0118	0.0149		0.0100	0.1388	0.1388	0.1388
37	Seneca Telephone	0.0192	0.0385	0.0192		0.0385		0.0179			0.0165	0.1265	0.1265	0.1265
38	Rock Port Telephone	0.0100	0.0147	0.0100		0.0147		0.0199			0.0139	0.0923	0.0923	0.0923
39	Goodman Telephone	0.0100	0.0164	0.0100		0.0164		0.0153			0.0165	0.0901	0.0901	0.0901
40	Lathrop Telephone	0.0112	0.0112	0.0112		0.0112		0.0176			0.0133	0.0842	0.0842	0.0842
41	AT&T Missouri	0.0095	0.0172	0.0095		0.0172		0.0080			0.0073	0.0574	0.0574	0.0574
42	CenturyTel of Northwest Arkansas	0.0100	0.0140	0.0100	0.0045	0.0140	0.0063	0.0090			0.0046	0.0513	0.0513	0.0513
43	Ozark Telephone	0.0100	0.0100	0.0100		0.0100		0.0071		0.0014	0.0038	0.0473	0.0473	0.0473

Total = 43 Incumbent Local Exchange Carriers — P = Premium Rate — d = Discounted Rate

Revision 59: 12-01-06 Updated AT&T Missouri, weightings. — Prepared by A.P.Kuss — Printed 12/05/06 11:31 AM

This represents an important source of revenues for rural ILECs, amounting to perhaps one quarter of revenues for some companies,[64] that is not available to wireless providers.

4.3 Wireless carriers make significant contributions to spectrum auctions

Unlike wireline carriers, wireless carriers make significant contributions to spectrum auctions. Wireless carriers do, of course, utilize this scarce resource while providing wireless service. The issue, however, is that the payments made via competitive bidding, reflect competition **between** wireless providers. For any given frequency slice of spectrum, a relevant question would be, what is the value of that spectrum by a non-mobile communications provider (e.g., for public safety, or other application)? Given the dollars collected from mobile communications providers from spectrum auctions, it is clear that there is a large premium paid for spectrum beyond the value in the next highest use (i.e., beyond the societal opportunity cost of spectrum for uses other than mobile communications providers).

One of the implications of this is that any public policy actions that asymmetrically disadvantage wireless providers, vis-à-vis wireline carriers, has the spillover effect of reducing payments for spectrum, and therefore reducing funding to the federal government.

4.4 Wireless services are taxed more heavily than wireline services

[64] Presentations at the Arizona-New Mexico Telephone Association, Spring 2003.

Wireless services are also slightly disadvantaged by higher taxes than those faced by wireline carriers.[65] Therefore, not only is this another source of competitive disadvantage for wireless providers (vis-à-vis wireline), but any additional competitive distortion through the universal service system (that favors wireline carriers) causes marginally lower tax revenues for the relevant tax authorities from wireless carrriers (vis-à-vis what would have occurred with symmetric treatment).

4.5 The U.S. Mobile-Party-Pays Regulatory Regime Disadvantages U.S. Mobile Providers

For the vast majority of telecommunications calls around the world, the principle of calling-party-pays is applied. That is, the network of the calling party bills the customer that originates the call (whether as part of a bundled offering or separately as an unbundled tariff charge), and that network then becomes responsible for paying any fees (e.g., terminating reciprocal compensation fees) to the network on which the call is terminated.

The two major exceptions to this world-wide rule are: 1) toll free (e.g., 800) calling; and 2) calls terminated on mobile phones in the U.S., Canada, and Hong Kong. In these three countries, this call payment system goes by the misnomer Receiving-Party-Pays (RPP) regimes; in fact, it is not the receiving party that pays, but rather the mobile party that pays for originating or terminating calls. In the rest of the world (under the traditional calling party pays regime), when a land-line customer originates a call to a mobile customer, the originating land-line customer pays for the call (often with asymmetrically higher termination rates to mobile networks, and asymmetrically higher retail usage rates).

The mobile-party-pays (or RPP if you wish) system of the United States creates a competitive disadvantage for U.S. mobile providers (vis-à-vis what would occur with traditional calling party pays as exists in the rest of the world, and vis-à-vis U.S. land-line providers). Indeed, RPP has likely contributed to many foreign countries having higher rates of mobile penetration than exist in the U.S.[66]

Moreover RPP is not technology neutral and favors landline over wireless technology. This regime means that land-line customers obtain value from originating calls to wireless customers, when the wireless customer pays to receive the call (unlike calling in the rest of the world).

4.6 Wireless Service Must Compete with Low Land-Line Subscription Prices

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[65] *See, e.g.,* Scott Mackey, *Excessive, Discriminatory Taxes on Wireless Hurt Consumers, Business, and U.S. Economy*, INFO. TECH. & TELECOM NEWS, (Apr. 2008), *available at* http://www.heartland.org/Article.cfm?artId=23012.

[66] *See* RCR NEWS, GLOBAL PENETRATION RATES (2005), *available at* http://www.rcrnews.com/assets/pdf/CR1236727.pdf(showing the top 20 nations by wireless penetration rate, of which the United States is not one); http://wirelessfuture.tribe.net/thread/2e3658c6-db4f-405e-806f-6dc12bb2e9f8

Because of the factors listed above (e.g., subsides from switched access charges), wireless services must compete with low land-line monthly service rates, especially in rural areas. The FCC's 12th CMRS Report discusses barriers to entry in the provision of wireless services.[67] In my opinion, the asymmetric disadvantages of wireless services vis-à-vis rural ILEC telephony are more significant than any of the potential barriers to entry discussed in the 12th CRMS Report.

The concept of land-line regulatory regimes disadvantaging wireless providers is not unique to the U.S. One article contends "One of the causes of Canadians' slowness to adopt cellular telephony is our regulatory policy: in particular, **long-standing cross-subsidies maintain artificially low wireline prices, reducing cellular's relative competitiveness and incentives to invest** in better quality, expanded cellular coverage." (emphasis added)[68]

4.7 The FCC's May 2008 Order of a Cap on Payments to Competitive (But Not Incumbent ETCs) is Neither Symmetric Nor Competitively Neutral

The FCC's Order is asymmetric and fails the test of competitive neutrality for at least two reasons. First, while the order does allow for an exemption "to the interim cap to the extent it files cost data demonstrating that its costs meet the support threshold in the same manner as the incumbent local exchange carrier (LEC)"[69] there does not seem to be a mechanism that allows a higher cost CETC to obtain higher funding. That is, if the CETC's funding will be less than the incumbent ETCs funding when its costs are lower, but it will not be higher when it's costs are higher.

Second, the cap appears to be binary; if the cost of the competitive ETC is less than the incumbent ETC, then the funding drops to a state-wide adjusted reduction value. The Order states: "For example, if, in State A, the capped amount is $90 million, and the total uncapped support is $130 million, the reduction factor would be 69.2 percent ($90/$130). In State A, each competitive ETC's uncapped support would be multiplied by 69.2 percent to reduce support to the capped amount."[70] However, if a specific CETC in State A has costs of 95% of the incumbent ETC, it appears that CETC would only receive 69.2% of the funding received by the incumbent ETC. Obviously, such asymmetric treatment is not competitively neutral.

4.8 Implications for USF Policy

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[67] *See* FCC, 12TH ANNUAL COMMERCIAL MOBILE RADIO SERVICES COMPETITION REPORT 70-102 (2008)(hereinafter "12th CMRS REPORT").

[68] GOLIATH BUSINESS NEWS, GOING MOBILE--SLOWLY: HOW WIRELINE TELEPHONE REGULATION SLOWS CELLULAR NETWORK DEVELOPMENT (Dec. 1, 2005), *available at* http://goliath.ecnext.com/coms2/gi_0199-5090139/Going-mobile-slowly-how-wireline.html

[69] High Cost Universal Service Support: Order, Docket 96-45, at Para. 1 (May 1, 2008)(Federal Register citation forthcoming, currently available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-122A1.pdf.

[70] *Id*. at Para.28.

The FCC and state commissions should consider the existing competitive distortions that already disadvantage wireless providers (vis-à-vis wireline providers) in the U.S. Any changes to the universal service program that further disadvantage wireless providers (or any other technology), given the existing distortions, would be especially egregious.

V. Eliminating the Identical Support Rule?

5.1 A Higher Proportion of Displaced Land-Lines Would Not Have Reduced Universal Service Payments Under the Current System.

At paragraphs 8-10 of the NPRM, the FCC suggests that much of its motivation to change the universal service support system is because "[t]hese wireless competitive ETCs do not capture lines from the incumbent LEC to become a customer's sole service provider, except in a small portion of households" and citing a value of 8%.[71]

I must respectfully disagree with the Commission's implied conclusion. The current system provides universal service subsidy payments to the rural land-line incumbents NOT on the basis of the number of land lines retained, but rather on the basis of the total embedded costs of rural ILEC. If this were not the case, payments to rural ILECs would have declined over time as their line counts fell; but payments to rural ILECs have remained relatively flat in recent years. Indeed, the full displacement of rural ILEC land-lines by growth in rural wireless line counts would have led to two types of events. First, there may have been miniscule reductions in the costs of rural land-line maintenance and operations expenses vis-à-vis what would have happened with actual rural land-line counts. Second, and more importantly, line losses may have been great enough that loss of revenues from services (including cross-elastic and so-called vertical features) would have eroded or eliminated rural land-line profits. This would have led to pressures for greater funding for universal service (at federal and state levels), increases in service prices, and reduced regulation of rural land-line service providers.

It is, therefore, logically inconsistent to, on the one hand, imply that the need for reform is based on the absence of rural land-line displacement, and, on the other hand, simultaneously claim that growth in rural wireless has triggered the need for reform.

5.2 Unequal Subsidy Payments are Antithetical to the Competitive Process

In the second sentence of its NPRM, the FCC states"… we tentatively conclude that we should eliminate the Commission's current 'identical support' rule …"[72] To understand the consequences of such a change, the Commission must consider how pricing occurs in unregulated markets.

In workably competitive markets, there is a strong tendency for similar offerings to have similar prices; in the absence of similar prices, consumers will tend to choose the

[71] NPRM at Para.9(citations omitted).

[72] *Id*. at Para. 1.

offering with the lower price.

When Universal Service is subsidized, the subsidy payment should represent part of the payment that would have occurred in a competitive market. The payment of two different subsidies to two providers, in the same market, both providing qualified service is antithetical to the competitive process. This is, to be blunt, a result that would not exist in a competitive market.

In workably competitive markets, as technology changes and cost structures change, market prices are likely to change over time. At any point in time, the price in the market will tend to reflect the full costs (both marginal/volume sensitive costs and volume insensitive costs) of the least efficient provider that is still in the market. Of course, there are likely firms that are marginally excluded (those that have either left the market, or did not yet enter) with slightly higher costs, than the least efficient provider. To the extent that there are other, more efficient, providers in the market, they receive the same price, but earn rents or quasi-rents from their more efficient operations. Over time, less efficient technologies tend to be displaced (either by the existing firms adopting the more efficient technology, or by new entrants utilizing the more efficient technology).

What does **not** occur in competitive markets are significantly different levels of compensation paid to firms offering similar services, simply because the firms have different costs.[73]

5.3 Unequal Subsidy Payments are Inconsistent With the FCC's Rationale in Reflecting the Costs of the Most Efficient Provider

In perhaps the most important single order in FCC history, the Commission dictated that UNE prices reflect the forward-looking costs of an efficient provider.[74] Similarly, in its USF order, the Commission adopted efficient forward-looking costs for universal service.[75] Therefore, the Commission dictated the use of cost calculations reflective of the least-cost most efficient provider for so-called non-rural ILECs for: 1) universal service subsidies; 2) unbundled network elements; and 3) reciprocal compensation. Two different levels of USF support to carriers within the same service areas is clearly in conflict with the concept of least-cost most efficient providers.[76] One (or more) carriers would be receiving support beyond the cost of the more efficient carrier.

5.4 A Symmetrically Applied Individual Cap Would Be Rationale and Competitively Neutral

A symmetrically applied cap, would provide sound signals to the market

[73] Indeed, this would imply unsustainably irrational consumer behavior.

[74] *In re First Implementation of the Local Competition Provisions in the Telecommunications Act of 1996,* 11 FCC Rcd 15499 (1996)

[75] *Id.*

[76] Holding aside the fact that the method of calculation may be based on embedded costs and therefore not reflective of forward-looking costs.

participants. Consider a mechanism where costs are calculated for each of the carriers in a service area, and the support value is determined by the lowest cost of the carriers. Such a mechanism is competitively neutral, and would, in the long run, send appropriate signals to market participants. However, the Commission may wish to consider a transition path toward the lower cost.[77]

While a symmetric cap (reflecting, but not necessarily equaling, the lower-cost provider) provides appropriate market signals, the asymmetric application of a cap only on CETCs[78] blatantly violates the principle of competitive neutrality.[79]

The Commission "tentatively conclude[s] that a competitive ETC should receive high-cost support based on its own costs, which better reflect real investment in rural and other high-cost areas of the country, and which creates greater incentives for investment in such areas."[80] Regardless of the validity of this statement, it is inconsistent with the notion of an asymmetric cap applied only to CETCs, and not incumbent ETCs.

5.5 The FCC Must Decide on the Application of a Symmetric Cap Prior to Obtaining Cost Data

An asymmetrical cap (only applied to wireless carriers) clearly violates the principle of competitive neutrality. A symmetrically applied cap (applied to both wireline and wireless carriers) could be competitively neutral. However, the choice of whether a symmetrically applied cap is used must be made in the absence of cost information. This would preclude a decision based on cost information, and the consequences of the decision on one technology vis-à-vis the other. The choice should be based on the Commission's judgment regarding sound public policy, not on the likely consequences for one technology over another.

VI. The Implications of Trends in Wireline, Wireless, and Broadband to Universal Service

6.1 Measures of Universal Service Are No Longer Predicated on Network Connection Via Land-Line Facilities

Consider the measures of telephone subscribership in the United States. The key question in the underlying surveys seeking to quantify subscribership had been: "is there

[77] As I noted above, dynamic competitive markets will tend to result in similar prices for similar services, but those prices may be above the lowest cost providers for some period of time as the new innovator reaps quasi-rents.

[78] High Cost Universal Service Support: Order, Docket 96-45, at Para. 1 (May 1, 2008)(Federal Register citation forthcoming, currently available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-122A1.pdf).

[79] See section 4.7, *supra*.

[80] NPRM at Para.5.

a telephone in this house/apartment?"[81] Before the 1990s, this question was likely designed and interpreted to refer to landline telephones. Indeed, in the FCC's Subscribership Reports, the word "wireless" or "mobile" does not exist regarding survey questions in reports released through February 2002.[82] Through November 2004, the relevant question had been: "Is there a telephone in this house/apartment?"[83] Because of the increasing number of households that have wireless only, one might wonder if some of these households may not consider their cell phones as a telephone. Consequently, beginning in December 2004, CPS [current population survey] changed its telephone question to ""Does this house, apartment, or mobile home have telephone service from which you can both make and receive calls? Please include cell phones, regular phones, and any other type of telephone."[84].Therefore, current measures of subscribership are intended to include wireless telephone service.

6.2 The Demand for Connectivity Across Time and Space[85]

Consumers around the world have expanded their demand for connectivity across time and space.[86] That is, the concept of universal service as a measure of service to physical *locations* is giving way to concepts of connecting *individuals* at all times and across geography.

The FCC's subscribership measures have for some time attempted to capture one aspect of connectivity for individuals rather than connectivity for buildings or locations. The subscribership surveys have for some time included questions regarding the "availability" of telephone service; those with service available include both telephone subscribers and those with access to telephone service outside of the residence *per se* (through the telephone of nearby neighbor or pay phone).[87]

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[81] *See* FCC, TELEPHONE SUBSCRIBERSHIP IN THE UNITED STATES (1997), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/subs1196.pdf.

[82] *See* FCC, TELEPHONE SUBSCRIBERSHIP IN THE UNITED STATES (2002), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/subs0701.pdf.

[83] FCC, DECEMBER 2006 MONITORING REPORT, fn 4 (2006), *available at* http://www.fcc.gov/wcb/iatd/monitor.html.

[84] FCC, DECEMBER 2006 MONITORING REPORT, fn 4 (2006), *available at* http://www.fcc.gov/wcb/iatd/monitor.html.

[85] "Connectivity" here is used broadly to refer to any form of demand for access to communications-like networks (voice or data) and it is not intended to imply only access to the Internet.

[86] Einstein's general theory of relatively is not required (nor is his special theory) to understand consumers' demands for connectivity. And while the gravity of this change in demand may not bend the fabric of space/time, it is bending concepts of connectivity and universal service. See (or do not see, since it is not required) ALBERT EINSTEIN, RELATIVITY: THE SPECIAL AND GENERAL THEORY (1920), *available at* http://www.bartleby.com/173/.

[87] *See, e.g.*, FCC, TELEPHONE SUBSCRIBERSHIP IN THE UNITED STATES (1997), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/subs1196.pdf (including the question: "Is there a telephone elsewhere on which people in this household can be called?").

With some reflection, the demand for access over time is quite intuitive. Telecommunications services are, as with most services (and unlike products), demanded and supplied within a specific time period. These services are non-storable by either consumers or producers; there is no inventory of calling minutes available to sit on a shelf in a provider's warehouse.[88] A minute of calling potentially available through existing facilities is gone and forever irretrievable once that minute is passed. Periods of time when a person does not have network access essentially represent periods of time for which they are not connected and are not part of universal service.

As people move, their demand for connection moves with them. People demand connectivity across space. A person that only has access for nine months of the year, but travels to a location that does not have network access (because of a seasonal job, for example), has a lower level of access than a person staying in the same location with access all twelve months of the year. A person with access to a network during working hours can be said to have greater connectivity than a second person without access at home or at work; a third person with access while at work and at home has better access than either of the first two people.

Fundamentally, there is no demand for access to a network for a building, a residence, or a location *per se*.[89] Rather, any implied demand for access at any point in space is derived through the demand by the individuals who are at that point in space, over some period of time.[90] A wireless phone, therefore, represents the current ultimate (until changing technology alters future customer perceptions) in an individual's access over time and space.

For each subscriber *i* there is a probability $\rho_i(t)$ at time *t*; that subscriber *i* is at a land-line subscribed location. When the expected willingness of *i* to pay for telecommunication with *j* at time *t* net of payments for usage $V_{ij}(t)$,[91] the location-specific subscription demand reflects the value $\sum_j \int_T \rho_i(t) \cdot V_{ij}(t)\, dt$. With mobile

[88] There is likely some propensity for pent-up demand to occur. For some calls, if either the originating or terminating party is not available, the call will be attempted at a later time. However, other calls will, if not initially successful, not be attempted later. Moreover, the opportunity cost of attempting to initiate calls, that have a significant probability of failure (not being completed) is likely to retard demand for usage and connectivity.

[89] The demand for access itself is a demand derived from the underlying demand for usage and an option demand (having the option for usage, even if no usage occurs).

[90] Mathematically one can think of the demand for connection for any finite period of time, e.g., a month, at a location as the summation (across individuals) of the integral of individual demand (across the time for which the individual is at the location).

[91] The value net of usage payments is appropriate since we are describing the demand for subscriptions alone (i.e., access to the network alone), not the demand for a bundled good of usage and access. The description reflects the fact that the demand for access is a derived demand, i.e., it is derived from the expected value from placing and receiving calls (less the price paid for access). See, e.g., Lester Taylor, TELECOMMUNICATIONS DEMAND IN THEORY AND PRACTICE 28-31, 83 (Kluwer Academic Publishers 1994)("As always, **usage drives access**, and types of access and usage drives customer-premises equipment.") (emphasis in the original).

communications, even with a subscriber frequently in transit or otherwise at locations without known land-line connections,[92] the full integral over $\rho_i(t)$ would be 1.0 less any time in areas without mobile service. As a practical matter, even with some areas without mobile service, the full integral of $\rho_i(t)$ over periods of mobile connectivity will be higher than for a land-line telephone.

6.3 Indications of Changes in Customer's Perceptions about Connectivity

There are several factors that indicate changes in customers' perceptions about connection to a modern communications network. These changes are driven in large part by experiences with wireless connections.

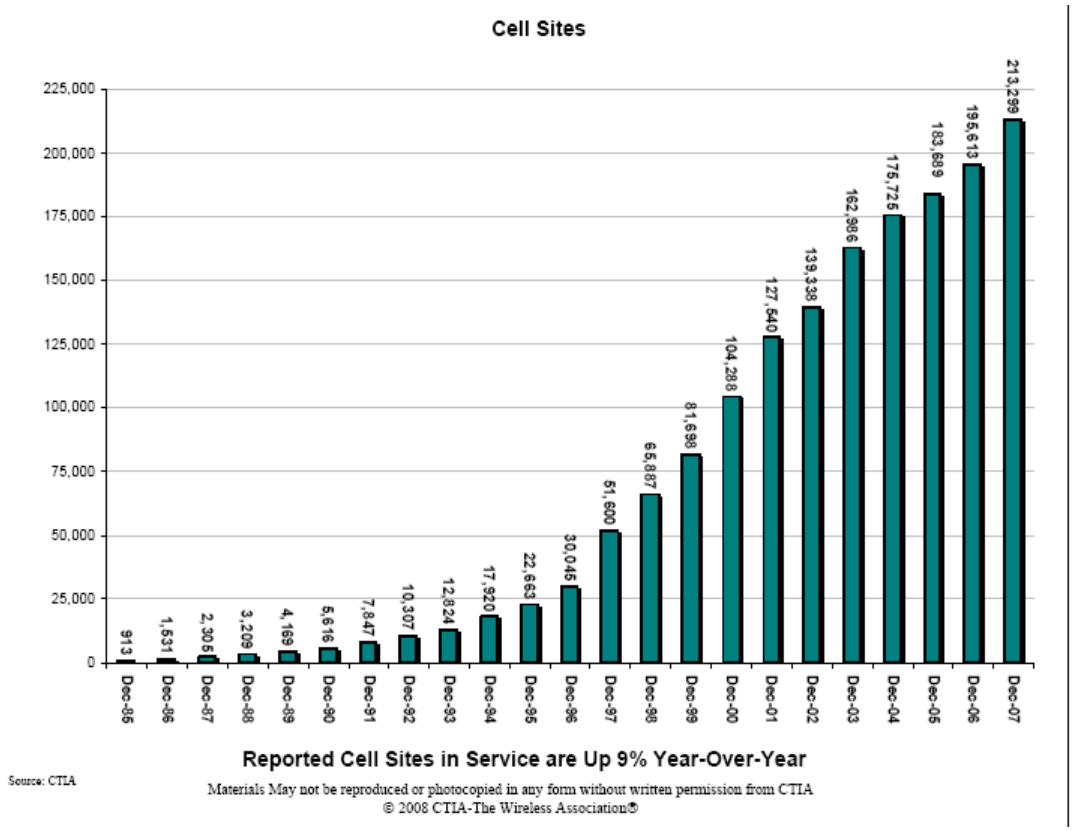
6.4 Growth of, and current high rates in, wireless penetration

One of the drivers of changing perceptions of connectivity has been the high rates of growth of wireless and the current high rate of penetration. This is true for both subscription and wireless usage. Significant wireless demand exists for voice communications and, more recently, for data communications as well.

Wireless coverage continues to expand. [93]

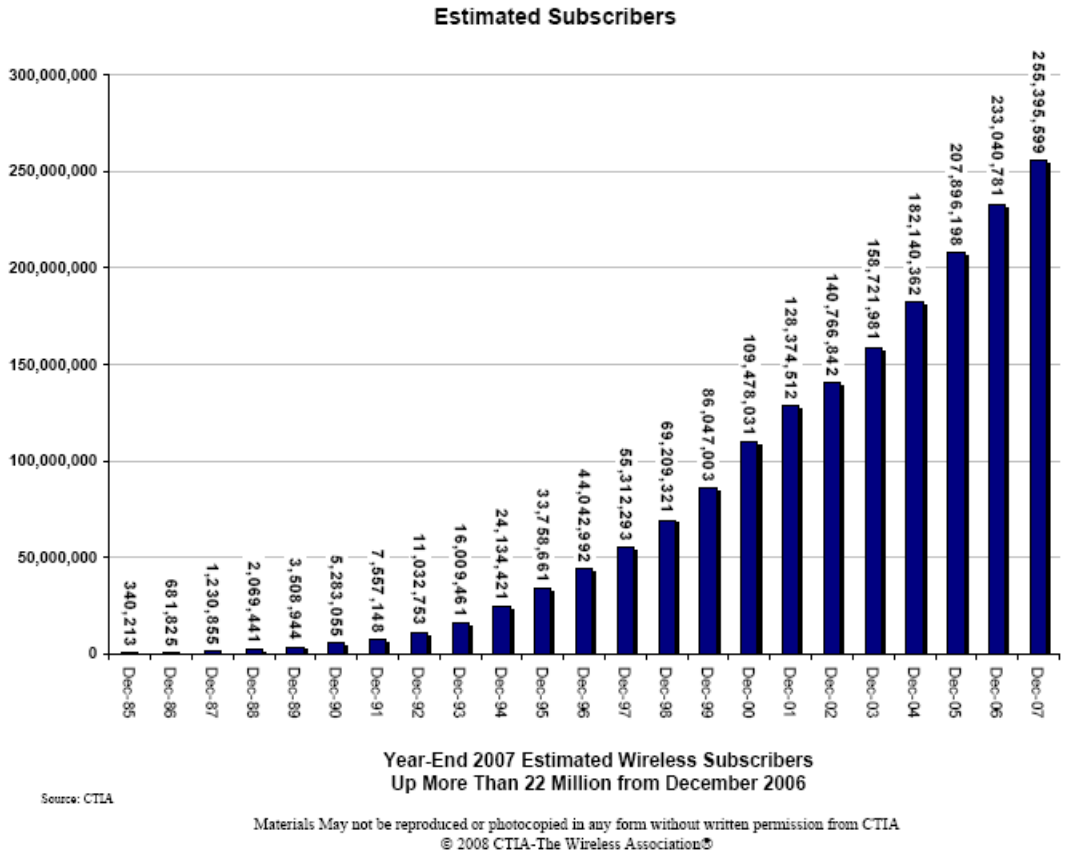
[92] "Known" has both an originating and terminating context. In the terminating context, those who other customers *j* wishing to place a call to *I* would need to know that location, and the land-line telephone number at that location and know when customer *i* is at the location. From an originating perspective, customer *i* would need to know that a land-line connection existed at the location, and have permission to use it.

[93] CTIA, SEMI-ANNUAL WIRELESS INDUSTRY SURVEY (2007), *available at* http://files.ctia.org/pdf/CTIA_Survey_Year_End_2007_Graphics.pdf



The count of total wireless subscribers also continues to grow, as seen from the graph below:[94]

[94] *Id.*



"The US mobile market in Q1 2007 continued its slow trudge towards 100% penetration, with the best part of two percentage points added in the quarter, to take the total to 79.6%. In absolute terms, there are now an (estimated) 239m mobile customers in the USA, up from 233m at the end of 2006 and 214m one year earlier."[95] CTIA provides a similar estimate of 258,728,971 U.S. wireless subscribers (as of May 12, 2008).[96]

Customers continue to indicate the higher value of wireless connections via the differential in growth rates (positive versus negative in this case) between land-line and wireless services. The FCC's 12th CMRS Report found that "In the last two years alone [2005 and 2006], the total mobile telephone subscriber base has increased 31 percent."[97]

It is noteworthy that more feature-rich technologies are still adding significant numbers of subscribers, as seen below.[98]

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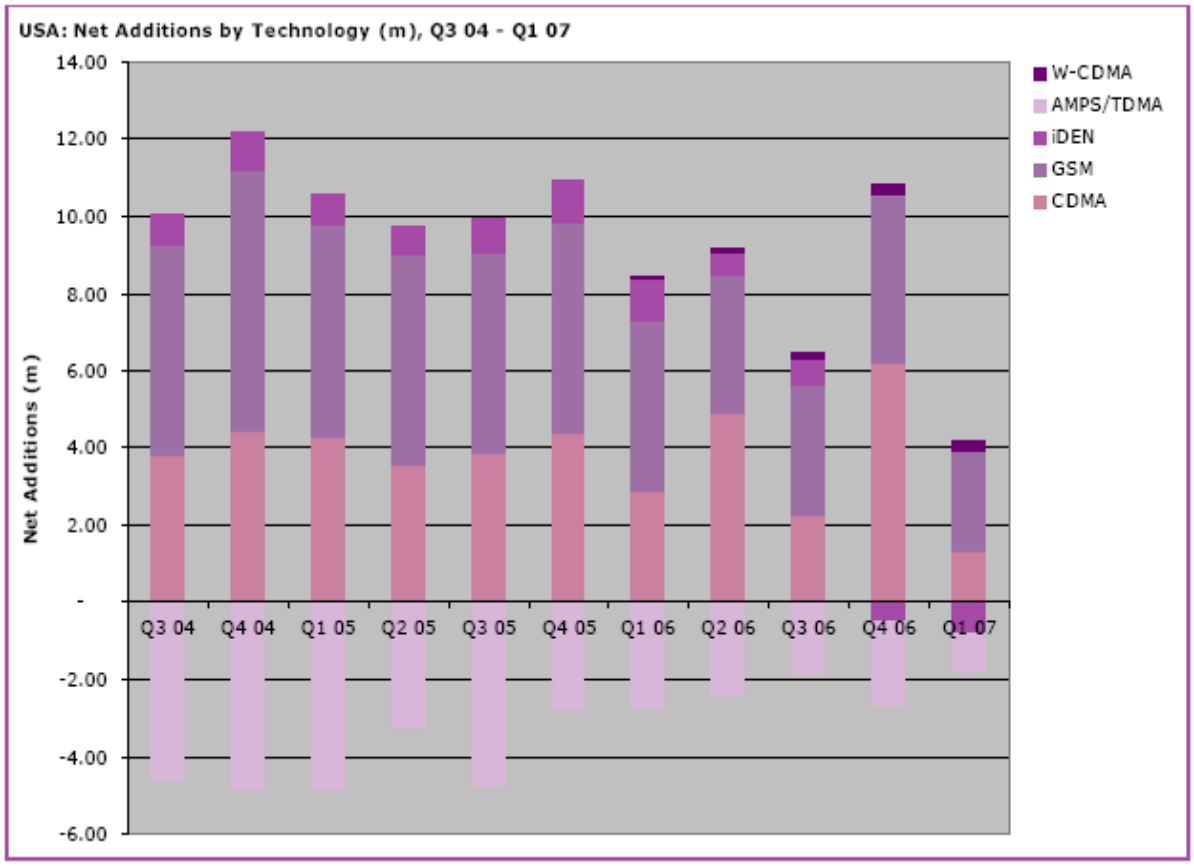
[95] *USA – Slowing Growth Suggests Further Need for Consolidation*, CELLULAR-NEWS, May 24, 2007, http://www.cellular-news.com/story/23948.php.

[96] CTIA, Estimated Current US Wireless Subscribers, http://www.ctia.org/ (last visited May 12, 2008)

[97] 12th CMRS REPORT at 93.

[98] *USA – Slowing Growth Suggests Further Need for Consolidation*, CELLULAR-NEWS, May 24, 2007, *available at* http://www.cellular-news.com/story/23948.php.



6.5 Substitution of wireless subscription for land-line subscription as the method of connection to the network

In the past, wireless service was seen as an adjunct to landline telecommunications service, mainly for users with very high demand for connectivity across time and space. Increasingly, however, subscribers are substituting wireless service for traditional landline service. The number of wireless users in the United States, which surpassed the number of wireline users for the first time in 2005, has continued to grow, as shown in the graph in the section above.

For the world in total, the predominance of wireless service (vis-à-vis land-line) is even more pronounced. "Largely because of the mobile phone boom in developing countries, telephone service has quadrupled in the past decade to 4 billion lines worldwide, according to a report Tuesday from the U.N. telecommunications agency. The International Telecommunications Union counts 1.27 billion fixed lines and 2.68 billion mobile accounts."[99]

[99] Alexander G. Higgins, *UN: World Now Has 4B Phone Lines*, USA TODAY, Sept. 5, 2007, *available at* http://www.usatoday.com/tech/wireless/phones/2007-09-04-cellphone-boom_N.htm.

6.5.1 Decline in wireline subscription.

Another indication is the reduction in growth and/or decline in wireline subscription.[100]

RESIDENTIAL LINE LOSS[101]

End-User Switched Access Lines Reported

Date	ILEC Lines	CLEC Lines	Total
Dec 1999	181,202,853	8,194,243	189,397,096
Jun 2000	179,648,725	11,557,381	191,206,106
Dec 2000	177,561,022	14,871,409	192,432,431
Jun 2001	174,752,275	17,274,727	192,027,002
Dec 2001	171,917,359	19,653,441	191,570,800
Jun 2002	167,330,006	21,644,928	188,974,934
Dec 2002	164,386,452	24,863,691	189,250,143
Jun 2003	158,274,538	26,985,345	185,259,883
Dec 2003	153,157,843	29,775,438	182,933,281
Jun 2004	147,993,218	32,033,915	180,027,133
Dec 2004	144,809,899	32,880,812	177,690,711
Jun 2005	143,757,708	33,975,336	177,733,044
Dec 2005	143,773,101	31,387,839	175,160,940
Jun 2006	142,293,047	29,896,109	172,189,156
Dec 2006	138,833,928	28,625,971	167,459,899
Jun 2007	134,458,920	28,711,461	163,170,381

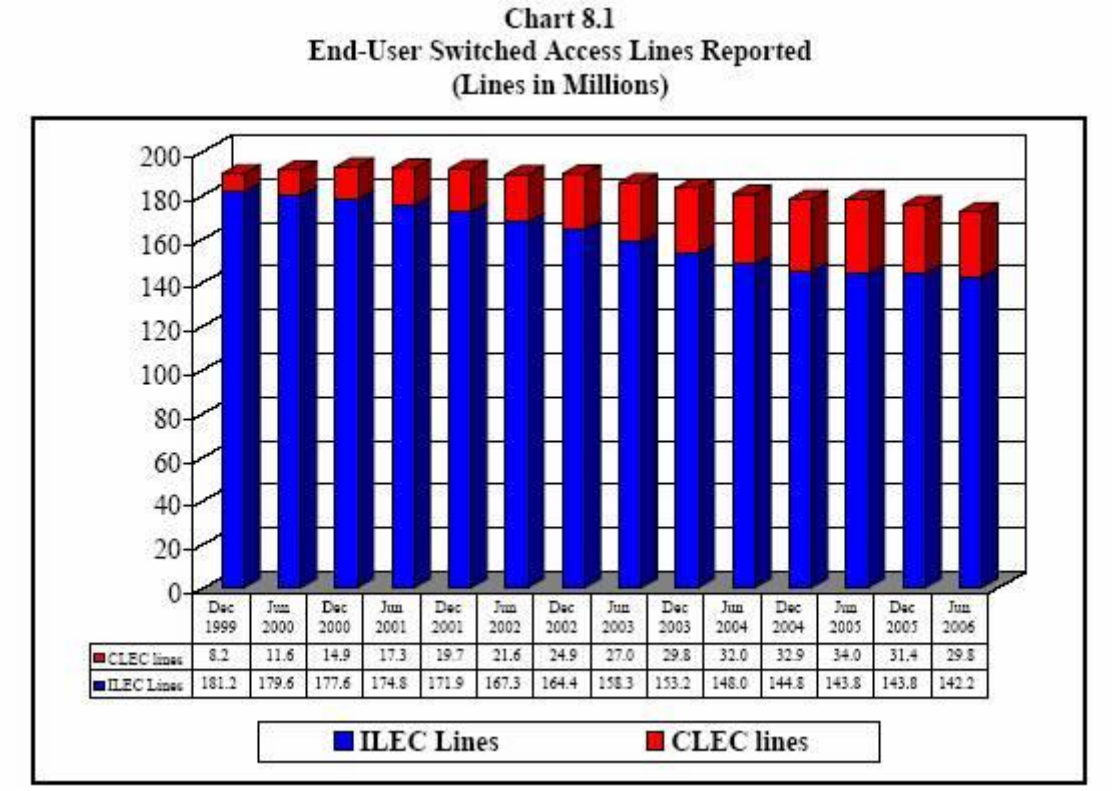
Between June 2001 and June 2007, U.S. LECs lost almost 30 million lines. These carriers' losses are indicative of a nationwide trend in declining subscriptions; the Telecommunications Industry Association (TIA) reports that wireline subscriptions dropped from 175.4 million users in 2005 to 161.2 million in 2006,[102] which supports

[100] The decline and/or fall in wireline subscription is likely due to a variety of factors including wireless growth, broadband substitution for second lines.

[101] FCC, WIRELINE COMPETITION BUREAU, LOCAL TELEPHONE COMPETITION 5 (2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280943A1.pdf.

[102] Denise Pappalardo, *Telecom Industry Continues to See Steady, Healthy Growth; Bundled Offerings, Residential VoIP and Wireless Adoption are Fueling Growth*, NETWORK WORLD, Jan. 25, 2007, http://www.networkworld.com/news/2007/012507-tia.html.

earlier trend data from the FCC:[103]



This trend was just beginning in 2002 for rural areas. Victor Glass (Director of demand forecasting and rate development at National Exchange Carrier Association, NECA) noted in 2002 that even though "most rural carriers haven't experienced a net line loss, [j]ust a few years ago, carriers in the NECA pool were growing access lines at around 5%, … [t]his year it will probably be less than 1%, in part due to the lowering of wireless prices."[104]

6.5.2 Substitution of wireless subscription for wireline subscription

Beyond the growth in wireless subscription and the decline of wireline, there are more explicit indications of the current predominance of wireless and wireless substitution for wireline. Even using data from 1999-2001, Professors Ward and Woroch have found significant positive cross-price elasticities between mobile and wireline usage.[105] Another study concluded:

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[103] FCC, TRENDS IN TELEPHONE SERVICE 59 (2007), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270407A1.pdf.

[104] Vince Vittore & Glenn Bischoff , *Access Line Count Evaporating*, TELEPHONY ONLINE, Oct. 14, 2002, http://telephonyonline.com/mag/telecom_access_line_count/.

[105] MICHAEL WARD & GLENN WOROCH, USAGE SUBSTITUTION BETWEEN MOBILE TELEPHONE AND FIXED LINE IN THE U.S. (2004), *available* at http://www.uta.edu/faculty/mikeward/mobile%20usage.pdf.

> "[i]n fact, overwhelming evidence shows that wireless services are replacing wireline services. … Based on an econometric model, this paper finds conclusive evidence that wireline and wireless are substitutes. This model finds that a one percent increase in wireline prices will result in a two percent increase in wireless demand. … it also means that price and service regulation is largely unneeded, since market forces are sufficient to hold prices in check."[106]

In 2005 "Sprint announced… that about 8,000 employees at Ford Motor will jettison their desktop phones and use cellphones exclusively"[107] Wireless providers have taken note of these trends, as evidenced by their marketing campaigns. T-Mobile has touted its product as ""the only phone you need".[108] Verizon Wireless prominently advertises the ability to allow customers to keep their landline phone numbers if they switch to wireless service.[109] It is also increasingly standard for wireless plans to offer unlimited calling to other customers of the same wireless provider and/or to family members on a family plan; Alltel has taken this one step farther by allowing subscribers to call any number – wireline or wireless – without additional charges as part of its My Circle offering.[110] These aspects of wireless plans make customers more likely to disconnect their wireline phone.[111]

Many customers have in fact chosen wireless as the complete replacement for wireline connection. A Yankee Group study shows substantial rates of wireless substitution in all of the twenty largest major metropolitan areas across the country, with a high of 19% in Detroit.[112] This trend appears to encompass the entire country, as National Center for Health Statistics data indicates that by the second half of 2006, roughly one out of every eight Americans lived in a home with exclusively wireless

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[106] Stephen Pociask, *Wireless Substitution and Competition: Different Technology but Similar Service – Redefining the Role of Telecommunications Regulation*, 5 COMPETITIVE ENTERPRISE INST. ISSUE ANALYSIS (2005).

[107] Chris Woodyard, *Some Offices Opt for Cellphones Only*, USA TODAY, Jan. 25, 2005, at B1.

[108] GLOBAL TECHNOLOGY FORUM, THE ONLY PHONE YOU NEED? (2006), http://globaltechforum.eiu.com/index.asp?layout=rich_story&channelid=3&categoryid=1&title=The+only+phone+you+need%3F&doc_id=9604.

[109] Verizon Wireless, Local Number Portability, http://www.verizonwireless.com/b2c/LNPControllerServlet (last visited May 13, 2008).

[110] Alltel Wireless, Alltel Circle – Choose Who You Call For Free, http://www.alltelcircle.com/ (last visited May 12, 2008).

[111] *See, e.g.*, Verizon Wireless, Enter Your Location (Plans), http://www.verizonwireless.com/b2c/store/controller?item=familyShare&action=viewFSPlanList&catId=322 (last visited May 12, 2008) (offering unlimited calling to both other Verizon customers and to members of a family plan); Cingular Wireless, Get Started, http://www.cingular.com/cell-phone-service/cell-phone-plans/family-cell-phone-plans.jsp?_requestid=626861 (last visited Jun. 4, 2007) (same for Cingular customers); Sprint, Unlimited Mobile to Mobile, http://www.nextel.com/en/services/calling/unl_mobile_mobile.shtml?id6=promo;mobiletomobile (last visited Jun. 13, 2007) (same for Sprint Customers).

[112] TELEPHIA TOTAL COMMUNICATIONS, MIDWESTERNERS CUT THE CORD (2006), http://www.telephia.com/html/documents/TotalCommunications_000.pdf.

phone service.[113] The especially high incidence of wireless substitution among younger groups, such as 18-24 year olds (of whom 22.6% live in wireless-only residences) would indicate that substitution will continue to increase.[114] This substitution of wireless for wireline need not be for the wealthy or trendy. On the contrary, evidence shows that adults living in poverty are substantially more likely to live in households with only wireless service.[115]

There also appears to be significant interest by existing combined service customers (currently subscribing to both wireless and wireline services) to completely substitute wireless via the disconnection of their wireline service in the future. Research by the Yankee Group shows the overall number of U.S. wireless users who have canceled wireline service to be rising by 1.5% every year.[116] J.P. Morgan estimates that wireless substitution will: (1) reach 20.3 million primary lines, or 18 percent of telephony households, by 2010, and (2) claim 8.5 million non-primary access lines, which in conjunction with broadband substitution, will precipitate non-primary access line losses of 11.7 percent per year; by 2010, wireless lines will have replaced about 29 million landlines, representing line substitution of 23 percent.[117] Some research predicts even higher levels of wireless-only households in the future, indicating that between 25% and 37% of Americans are expected to switch to wireless-only service by 2009.[118]

The FCC 11th report on CMRS found: "According to one survey from early 2006, while only 12 percent of cellphone users use cellphones as their only phone, an additional 42 percent said they also had a landline phone but used their cellphones 'most'". In addition, one analyst estimates that customers in nearly a third of American households make at least half their long-distance calls at home from their cell phones rather than from their landlines."[119]

These findings are supported by other research, which reports that many current wireline users are considering cutting the cord. A February 2006 In-Stat survey found that close to 20 percent of respondents that have wireless service plan to drop wireline

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[113] *See* STEPHEN J. BLUMBERG, & JULIAN V. LUKE, DIVISION OF HEALTH INTERVIEW STATISTICS, NATIONAL CENTER FOR HEALTH STATISTICS, WIRELESS SUBSTITUTION: ESTIMATES FROM THE NATIONAL HEALTH INTERVIEW SURVEY 2 (2006), *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200705.pdf.

[114] *Id.* The prevalence of substitution decreases uniformly as age rises.

[115] *Id*. 15.8% of adults below the poverty line live in wireless-only households.

[116] Robin Arnfield, *Consumers Give up Land-Lines for Cell Phones*, NEWSFACTOR.COM, Oct. 22, 2004, http://www.newsfactor.com/story.xhtml?story_title=Consumers-Give-up-Land-Lines-for-Cell-Phones&story_id=27822.

[117] J. CHAPLIN, *ET AL*., J.P. MORGAN, TELECOM SERVICES / WIRELINE, STATE OF THE INDUSTRY: CONSUMER, p. 4, tbls. 57 & 75 (2006).

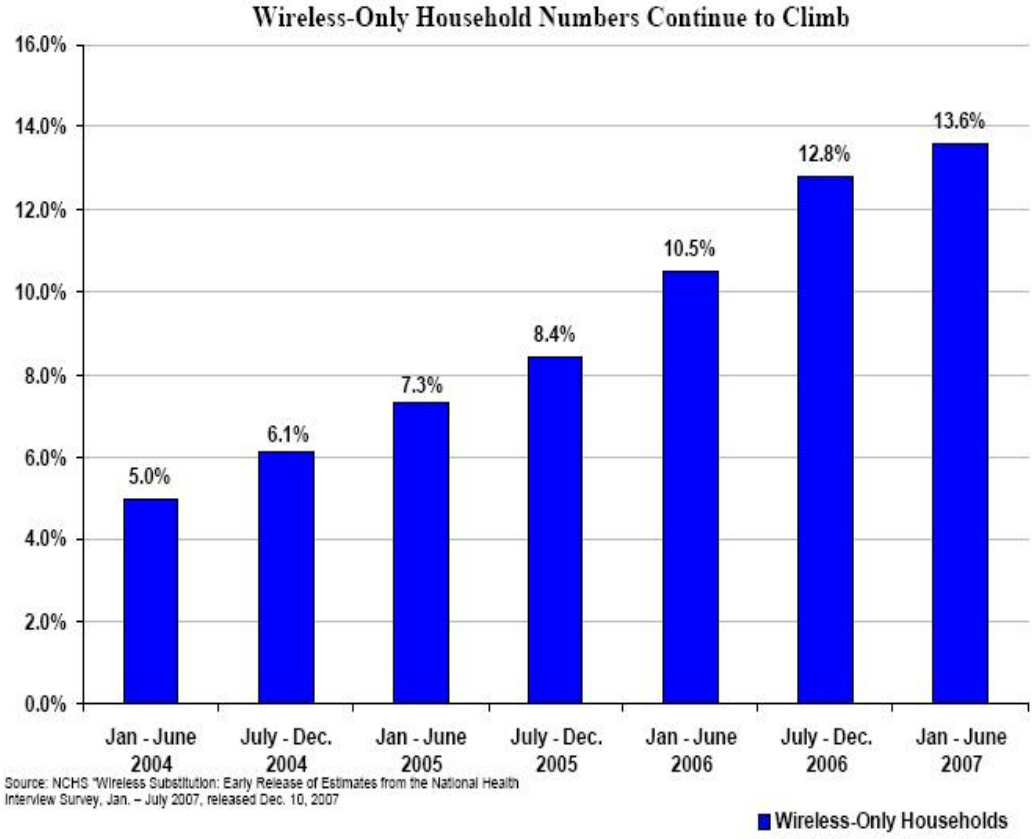
[118] INSTAT RESEARCH GROUP, CUTTING THE CORD: CONSUMER PROFILES AND CARRIER STRATEGIES FOR WIRELESS SUBSTITUTION (2005), *available at* http://www.instat.com/Abstract.asp?ID=231&SKU=IN0502092MCM.

[119] FCC, ELEVENTH ANNUAL REPORT TO CONGRESS ON THE STATE OF COMPETITION IN THE COMMERCIAL MOBILE RADIO SERVICES (CMRS) INDUSTRY, Conclusion ¶ 215 (2006), *available at* http://wireless.fcc.gov/cmrsreports.html.

service.[120] With more than 95 percent of the U.S. population exposed to broad wireless network coverage, the high saturation of wireless service offerings by the nation's six leading wireless carriers, and the increasingly affordability of large blocks of minutes, the Yankee Group considers wireless substitution to be "a significant and unstoppable trend".[121]

In the opening sentence of the most recent publication by Center for Disease Control (CDC) states: "Preliminary results from the January–June 2007 National Health Interview Survey (NHIS) indicate that more than one out of every eight American homes (13.6%) had only wireless telephones during the first half of 2007."[122]

The CDC also concluded "The percentage of adults living in wireless-only households has been steadily increasing since 2003."



[120] *See* INSTAT RESEARCH GROUP, SURVEY SHOWS THAT WIRELINE EROSION WILL ACCELERATE; 20% OF HOUSEHOLDS PLAN TO CANCEL OR NOT USE WIRELINE SERVICES (2006), *available at* http://www.instat.com/newmk.asp?ID=1577.

[121] A*re Americans Cutting The Cord?*, TELECOMWEB NEWS DIGEST, Sept. 12, 2005, http://www.accessmylibrary.com/coms2/summary_0286-9609806_ITM.

[122] STEPHEN J. BLUMBERG & JULIAN V. LUKE, NATIONAL CENTER FOR HEALTH STATISTICS, CENTERS FOR DISEASE CONTROL, WIRELESS SUBSTITUTION 1 (2007)(hereinafter "CDC REPORT").

Moreover, 21.6% of the poor households, 18.5% of near poor households, and 28.2% of households renting had only wireless phones.[123] This is particularly noteworthy since these are the households for which potential subscribers are making the difficult choices between network offerings and those facing significant income constraints; they are choosing wireless service in relatively high proportions. In addition, these are the households for which rational, means-based universal service should be directed.

Morgan Stanley concluded "[w]e forecast that another 21 million households will go wireless only over the next five years [in 2012], reaching 32% of households."[124] Such forecasts are consistent with trends among the portion of the U.S. population aged 18-30, where between 25% and 30% of this segment is wireless-only;[125] as the population ages, this group likely becomes more representative of future older age groups.

Wireless characteristics in other countries likely suggest the future in the U.S. In Austria 33% of homes are already wireless-only.[126]

6.6 Substitution of wireless calling for land-line calling

6.6.1 Growth of wireless usage and decline in land-line usage

As with the substitution of wireless for wireline penetration, one indication of wireless substitution in usage is the growth in wireless calling. The CTIA reported that wireless customers used approximately 1.8 trillion minutes of service during 2006.[127] Moreover, the CTIA found that wireless minute consumption has grown by approximately 20% year after year since the statistic was first kept:[128]

The FCC found: "Wireless subscribers continue to increase the amount of time they communicate using their wireless phones. Average minutes-of-use per subscriber per month ("MOUs") jumped again in 2005, to 820 minutes, or more than 13 hours of use, for the average subscriber of a nationwide operator in the last quarter of the year."[129]

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[123] Id, at tbl. 2.

[124] MORGAN STANLEY, TELECOM SERVICES CUTTING THE CORD: WIRELESS SUBSTITUTION IS ACCELERATING (2007).

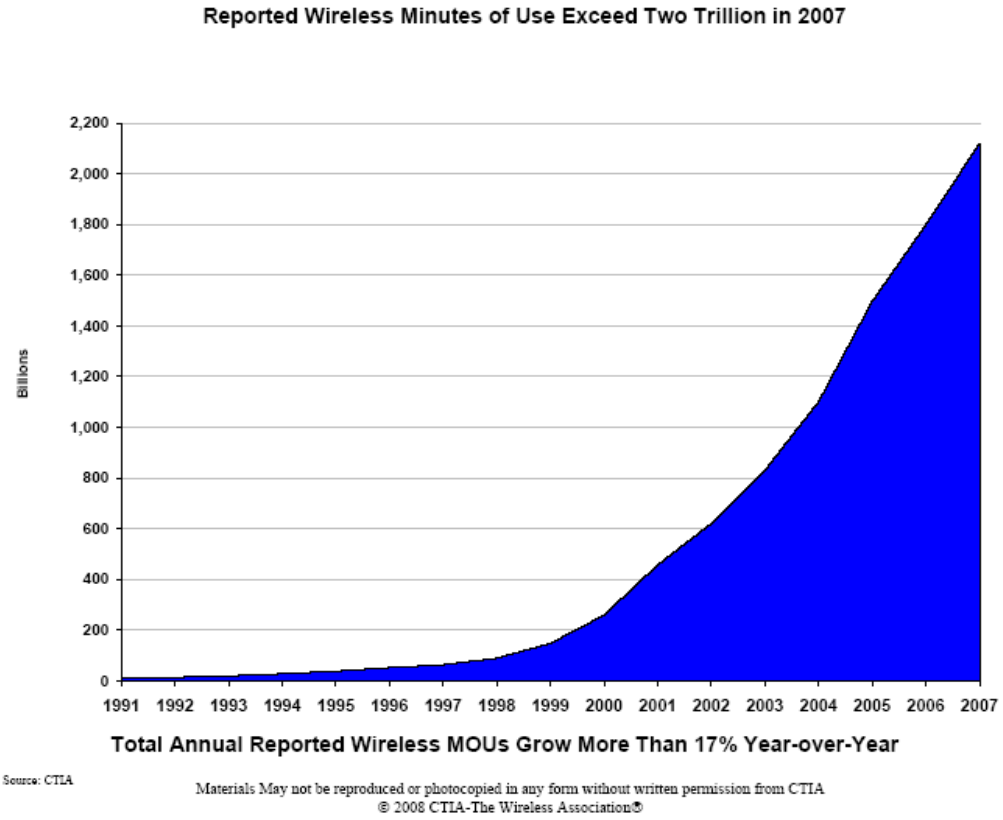
[125] *Id*. at pg. 8, exhibit 14.

[126] *Id*. at pg. 5, exhibit 7.

[127] CTIA, SEMI-ANNUAL WIRELESS INDUSTRY SURVEY (2007), *available at* http://files.ctia.org/pdf/CTIA_Survey_Year_End_2007_Graphics.pdf.

[128] *Id.*

[129] 12TH CMRS REPORT at Para. 217.



Conversely, wireline usage has continued to fall. As noted earlier, an In-Stat survey found that nearly 20% of respondents plan to drop landline phone service in the near future[130] Long-distance usage has been particularly affected, with nearly half of respondents indicating decreased landline usage, and the average decrease being 60 percent.[131]

Since wireless carriers receive virtually no switched access revenues in the U.S., this projected decline is purely a reflection in the decline of interstate wireline calling. In one article, "Sprint apportioned 75% of the impact [of reductions in consumer long distance voice volume] to wireless substitution."[132] This trend is not specific to the U.S.. In Sweden, "[t]otal annual fixed line call revenue was estimated at SEK19.5 billion (USD 2.8 billion) by the PTS, down 11% year-on-year, whilst the watchdog also reported that mobile phone usage doubled in the past two years.[133]

[130] INSTAT RESEARCH GROUP, WIRELINE USAGE CONTINUES TO SLIDE (2006), *available at* http://www.highbeam.com/doc/1P1-118134971.html.

[131] *Id.*

[132] 2020Insight.com, Wireless Killed Telecom Long Distance, http://www.2020insight.com/otherreports/wktld.htm.

[133] Teleography, *VoIP subscribers up 87%*, TELEGEOGRAPHY'S COMMSUPDATE, Jun. 8, 2007, http://www.telegeography.com/cu/article.php?article_id=18232.

6.6.2 The wireless phone has become the primary phone for many users

Beyond the basic indications of wireless usage substitution, there is more specific evidence that some customers do in fact substitute wireless usage for landline usage. Of the roughly 74% of Americans who subscribe to wireless service, one quarter say that they consider their cell phone to be their primary means of communication.[134] Leap Wireless indicates that 52% of its subscribers claim that their Leap wireless phone is their primary phone.[135]

Wireless usage substitution is not isolated to urban areas. In a survey conducted back in January 2003 of counties with population density less than eight people per square mile, of those with wireless service, 48% of respondents reported that wireless service has replaced 90% or more of their landline long distance.[136] At that time, one-half of rural wireless customers "stated that their wireless phone has become more important to them and their landline phone has become less important."[137] Subscription data in the U.S. has born this out as well, with rural wireless penetration in early 2006 trailing the urban wireless penetration rate by only 3.4%.[138]

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[134] *About One-Quarter of Current Mobile Phone Subscribers Support Incentive-Based Advertising, According to a Survey by Harris Interactive*, PR NEWSWIRE, Oct. 6, 2006, http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/10-06-2006/0004447079&EDATE=.

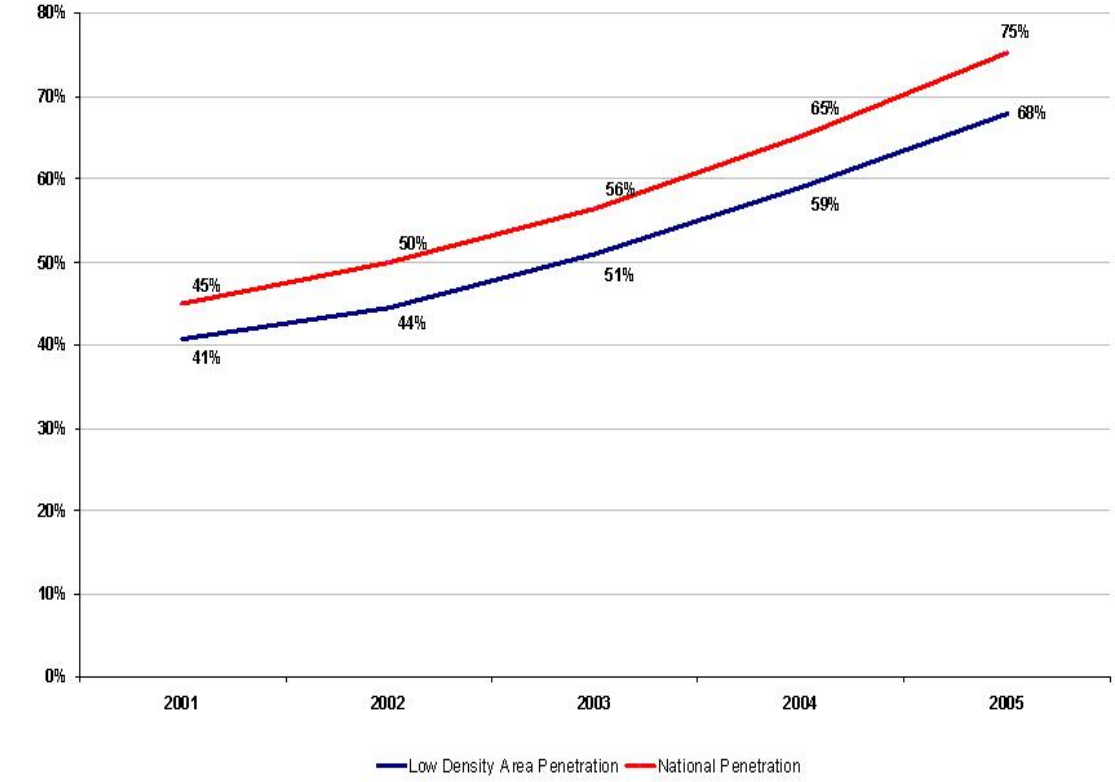
[135] Patrick Baltatzi, *Profiting from Customers Others Avoid*, CNN, Apr. 18, 2006, http://money.cnn.com/2006/04/18/technology/business2_thirdscreen0418/index.htm.

[136] WESTERN WATS, WIRELESS TELEPHONE SERVICE BECOMES ESSENTIAL COMMUNICATIONS TOOL (2003) (reporting a January 2003 survey of 1000 wireless customers in counties with population density below eight people per square mile). *See also* Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services, 69 Fed. Reg. 75144-01, (Feb. 3, 2003)(codified in scattered sections of 47 C.F.R.)(comments of Western Wireless Corporation

[137] *Id.*

[138] CTIA, A PLAN FOR PRO-CONSUMER, PRO-RURAL HIGH-COST UNIVERSAL SERVICE REFORM 4 (2007), *available at* http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518914437.

Rural and National Wireless Penetration: Rural Equated with Fewer than 100 Pops per Square Mile

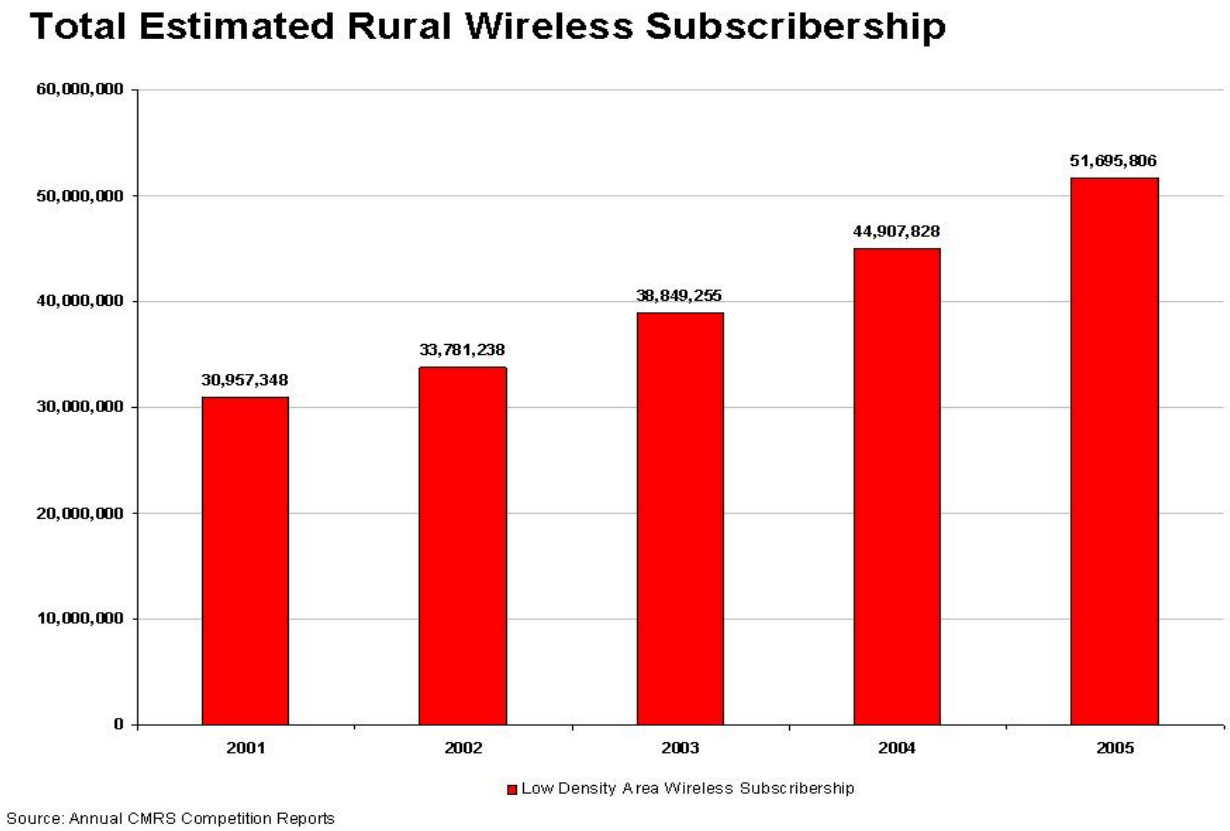


Source: Annual CMRS Competition Reports

An example of rural wireless growth is Leap Wireless, which markets largely to rural areas through its subsidiary Cricket, offering "a simple and affordable wireless solution alternative to traditional landline service offering unlimited anytime minutes within a Cricket calling area over a high-quality and all-digital CDMA network". On December 31, 2006, it had approximately 2,230,000 customers located in 22 states in the United States."[139] Leap's success is indicative of overall trends, as rural wireless subscribership rose to over 50 million subscribers in 2005:[140]

[139] Wright Investors Service, Leap Wireless International – Company Profile, http://wrightreports.ecnext.com/coms2/reportdesc_COMPANY_521863308.

[140] CTIA, SEMI-ANNUAL WIRELESS INDUSTRY SURVEY 5 (2007), *available at* http://files.ctia.org/pdf/CTIA_Survey_Year_End_2007_Graphics.pdf



Outside of the U.S., increasing wireless usage has spread to areas where consumers have never had the opportunity to own a wireline phone. Experts predict that worldwide wireless usage will jump from the current 2.2 billion users to 3 billion by the end of 2007, with much of the growth to come from new subscribers in emerging economies such as India, China, Africa and Latin America.[141]

6.6.3 Customers Would Find it Harder to Give Up Their Cell Phone Than Their Land-Line Phone

In a study by the Pew Internet and American Life Project, in 2007, 51% of survey respondents (who used each device) said it would be very hard to give up their cell phone, while only 40% said it would be very hard to give up their land-line telephone.[142] These values are significantly changed form 2006 when 43% of respondents said it would be very had to give up their cell phone, and 48% said it would be very hard to give up their land-line telephone, and are even further removed from 2002, when only 38% of

[141] Marguerite Reardon, *Emerging markets fuel cell phone growth*, CNET NEWS, Feb. 14. 2007, http://news.com.com/Emerging+markets+fuel+cell+phone+growth/2100-1039_3-6159491.html.

[142] JOHN HORRIGAN, PEW INTERNET & AMERICAN LIFE PROJECT, 62% OF ALL AMERICANS ARE PART OF A WIRELESS, MOBILE POPULATION THAT PARTICIPATES IN DIGITAL ACTIVITIES AWAY FROM HOME OR WORK 1 (2007), *available at* http://www.pewinternet.org/pdfs/PIP_Mobile.Data.Access.pdf.

respondents said it would be very hard to give up their cell phones, while 61% said it would be hard to give up their land-line telephone. An indication of the propensity of wireless customers to use their mobile phone as their primary, or only phone, is shown by Leap's Cricket phone.

> And 52 percent of Cricket customers have "cut the cord" and rely solely on Cricket for their phone service. … In addition, 93 percent of Cricket customers reported their Cricket phone was their primary phone … 53% of Cricket customers are either Hispanic or African-American … Additionally, 57% of Cricket customers report that they make less than $35,000 per year.[143]

Part of the reason for the high proportions of customers that use the Leap Cricket phone as their primary, or their only, phone, appears to be the Leap Cricket unlimited calling plan. With the introduction of unlimited calling plans by other providers,[144] the proportion of customers for which their mobile phone is their primary, or their only phone, should become even larger.

It is also noteworthy that Leap Cricket customers, are disproportionately among lower income subscribers and that they express a mobile-only or mobile-primary preference. This is consistent with the CDC report cited above.[145]

Similarly for small businesses:

> "Currently, four in ten (42 percent) of small business owners surveyed said they could not survive — or it would be a major challenge to survive — without wireless technology. This trend will likely increase because more than half (51 percent) of the respondents said they rely on wireless technology more today than two years ago, and even more (55 percent) said they expect to depend on it even more two years from now."[146]

6.4 Intermodal Competition Exists in Real Markets, Regulation Tends to Greatly Lag Market Phenomenon

The real world is replete with examples of intermodal competition.[147] Intermodal

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[143] Leap Wireless, Leap Services, http://www.leapwireless.com/l1_our_cricket_service.htm (last visited Mar. 24, 2008).

[144] *See, e.g.*, Sprint, Simply Everything Plan, http://www.sprintspecialoffers.com/everything/?id9=SEM (last visited Mar. 29, 2008)(offering unlimited wireless calling and data service for $99.99/month); AT&T, Cell Phone Plans and Cellular Service, http://www.wireless.att.com/cell-phone-service/cell-phone-plans/index.jsp (last visited Mar. 29, 2008)(offering unlimited wireless calling for $99.99/month).

[145] *See* CDC REPORT at 3(finding that low-income adults were more likely to live in wireless-only households).

[146] Press Release, AT&T, NATIONAL AT&T SURVEY RANKS SAN DIEGO SMALL BUSINESS OWNERS SECOND HIGHEST IN 'WIRELESS QUOTIENT' OR 'WIQ' Sept. 25, 200,7 http://www.att.com/Common/merger/files/pdf/smallbiz/San-Diego-Survey.pdf

[147] Based upon my research, that was presented, in part, in the Direct Testimony of Dr. Richard Emmerson, on behalf of Nevada Bell Telephone, in re the matter of the application of Nevada Bell

competition by canal barges greatly reduced the demand for horse-drawn wagons on some routes in the mid 19th century. Railroads led to the decline of the canal barges later in the 19th century;[148] indeed it could be considered to be the indirect cause of the Johnstown flood of 1889.[149] Intermodal competition by automobiles and the trucking industry lead to decline of the railroad passenger and cargo business during the 1900s. Trucking in turn experienced additional competition from partially air-based firms such as Federal Express.

In the FCC's first Computer Inquiry (1966-1070) there were concerns that AT&T might control the market for "data processing."[150] At points in time, it may have appeared that there were clear and separate markets for computer terminals (and later "smart terminals"), mainframes and then later mid-size computers; few initially expected that personal computers would be anything other than a tiny niche adjacent to the market for "smart terminals". MCI's Execunet service drastically changed the telecommunications landscape in 1973, by combining leased private lines, foreign exchange (FX) service, and call control functions to compete with AT&T's switched voice service.[151]

Intermodal competition often blurs the boundaries of markets. In addition, there seems to be a tremendous propensity for regulators to dismiss intermodal competition. By nature, it appears that markets follow technology with a lag, and regulation generally

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Telephone Company, to reclassify business subscriber access services as competitive services, February, 2005.

[148] *See, e.g.*, MUNICIPALITY OF BUFFALO, NEW YORK, A HISTORY. 1720-1923 (Henry Wayland Hill, ed., 1923), *available at* http://www.buffalonian.com/history/industry/railways/EarlyRailroads1.html("Fortunately for the railway promoters, the State legislators did not at that time feel that railways could ever seriously compete with the Erie Canal in the matter of freight transportation, otherwise there is reason to believe that the railway charter would not have been granted for very many years, for the railway would constitute direct opposition to the canal, in the construction of which the state had invested much money."). ("In the early decades there was keen competition for tonnage between the Erie Canal and the railways, and the Erie Canal held its own until the 'eighties as carriers of grain. Both means of transportation are needed, but the railways have for several decades earned premier place. In the first years of operation, the railway companies had to pay tribute to the Canal in the way of tolls on freight handled by the railways that might otherwise have been carried on the Canal. It was a somewhat arbitrary exaction, but seemed to only slightly affect the development of the railway systems. Railway tolls were abolished in 1851; Canal tolls were abolished altogether in 1882 on the Erie Canal, and other State canals.")

[149] The History Channel, Modern Marvels: Engineering Disasters, http://www.jaha.org/historychannel.pdf. Lake Conemaugh was created in 1878 to provide a sustained summer flow for the Pennsylvania Mainline Canal. However, by 1889, competition from railroads had caused the canal company to essentially abandon the canal and leave the dam in disrepair. On June 1, 1889, the dam failed causing a wall of water to crush Johnstown, killing over 2,200. (*See also* Johnstown Pennsylvania Information Source Online, Johnstown Flood of 1889, http://www.johnstownpa.com/History/hist19.html).

[150] *See, e.g.*, HANK BRANDS & EVAN T. LEO, THE LAW AND REGULATION OF TELECOMMUNICATIONS CARRIERS 478-96 (1999).

[151] *See* GERALD BROCK, TELECOMMUNICATIONS POLICY FOR THE INFORMATION AGE: FROM MONOPOLY TO COMPETITION 135-39 (1994).

follows markets with an even greater lag.[152]

It is important for the Commission to recognize the potential for intermodal competition and avoid distorting the competitive process by disadvantaging one mode (one technology) vis-à-vis another.

6.5 Voice Over Internet Protocol (VOIP) technology contributes to the decline in circuit-switched wireline usage

Growth of VOIP has also contributed to the decline in traditional circuit-switched wireline subscription and usage, as VOIP growth strategies target both private residential and commercial/small business markets. The Yankee Group estimates that VOIP subscription will reach 14 million by the end of 2007, a relatively small share of the telecommunications market.[153] However, a survey from Boston-based Infonetics estimates the number of 2008 subscribers at 20.8 million, and a report from Framingham, Mass.-based IDC predicted almost 27 million subscribers by 2009.[154]

Small businesses and other commercial enterprises are also increasingly adopting VOIP. VOIP is currently used in some form or another by 20% of U.S. businesses, and robust business adoption of VoIP should continue, as In-Stat predicts that two-thirds of US businesses will have some form of VoIP service by 2011.[155] Similarly, AMI-Partners predicts that market penetration of hosted VoIP seats will increase from less than 2 percent in 2006 to over 7 percent by 2010, with a cumulative annual growth rate of 65 percent.[156] AMI also predicts that, while telecoms are not currently marketing VoIP services aggressively to small and medium businesses because of fears of cannibalizing their customer base and revenues, as the market growth and adoption rate increase, leading telecom service providers will become more aggressive in marketing VoIP to small and medium businesses.[157] It remains to be seen whether this considerable growth will give rise to a VoIP substitution phenomenon of the magnitude of wireless-for-wireline substitution. One source concludes "VoIP will be part of 34% of those

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[152] *See, e.g.*, IPSOS-MORI PARTNERSHIP, KEEPING UP WITH THE GATES': REGULATION LAGS BEHIND RAPID TECHNOLOGICAL INNOVATION (2006), *available at* http://www.sigmascan.org//ViewIssue.aspx?IssueId=68.

[153] YANKEE GROUP, COMPETITIVE PRESSURES MOUNT IN CONSUMER VOIP MARKET (2007)*available at* http://www.yankeegroup.com/ResearchDocument.do?id=1558.

[154] Greg Soblete, *VoIP Growth Accelerating*, TWICE, May 25, 2005, http://www.twice.com/article/CA603113.html.

[155] INSTAT RESEARCH GROUP, BUSINESS VOIP: MULTIPLE FLAVORS DRIVE GROWTH (2007), http://www.instat.com/E-Deliv/CT/2007/IN0703862CT.pdf.; *See also* Andrew Hickey, *VoIP market evolves in 2007*, COMPUTER WEEKLY, Jun. 8, 2007, http://www.computerweekly.com/Articles/2007/06/08/224630/voip-market-evolves-in-2007.htm.

[156] AMI PARTNERS, SMB INTEREST PERKS UP IN HOSTED VOIP (2007), http://www.efytimes.com/efytimes/fullnews.asp?edid=18543.

[157] *Id.*

residential subscriptions in 2010, an increase from 10% last year."[158]

I am hopeful that the June 1, 2007 decision by the D.C. Court of Appeals, vacating part of the FCC order under which VoIP providers must contribute to the USF, is only a temporary bump on the road to sound public policy.[159] Asymmetric funding (like asymmetric receipt of funds) is not competitively neutral. Funding for USF should be as broad-based as possible and technology-neutral.

6.6 The use of dual mode phones and femtocell technology may greatly expand wireless concepts of connectivity

The growth in WiFi and WiMax deployment (see section below), has not only changed expectations about wireless data connections, it has the potential to drive major changes in voice communications as well. Some types of Dual mode phones[160] can switch between GSM/CDMA/W-CDMA and other platforms such as IEEE 802.11 (Wi-Fi). For example, T-Mobile touts its "Hot-Spot at Home" phone.[161] Such phones are likely to be increasingly common over the next few years. "According to senior analyst Philip Solis [ABI research], handsets based on the 802.11n protocol will outnumber those of other protocols in those 300 million shipments. Why? 'Cellular handset vendors have made sure that their voices have been heard in the 802.11n standards process, so they are getting all the optional features that they want.'"[162] Also, these phones offer the advantages of reducing cell congestion, increasing home quality, and preserving customers' minutes.[163] Falling costs and increased features will also drive expanded adoption of these phones: "[a]lready, there is no shortage of WLAN gadgets - it's becoming a standard feature of smartphones, as the cost of incorporating a WLAN radio has fallen to around $5 per device."[164] "Crystal ball gazers at In-Stat said Wednesday that

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[158] Dan O'Shea, *TIA study: Global telecom market at $3 trillion*, TELEPHONY ONLINE, Jan. 26, 2007, http://telephonyonline.com/voip/finance/tia_telecom_market_012607/.

[159] Vonage v. FCC, 489 F.3d 1232 (DC Cir. 2007)(concluding that the FCC has statutory authority to require VoIP providers to make USF contributions and that it acted reasonably in analogizing VoIP to wireline toll service for purposes of setting the presumptive percentage of VoIP revenues generated interstate and internationally). *See also, Court Partly Vacates FCC Order Applying USF To VoIP Providers*, TELECOM AM, Jun. 4, 2007.

[160] A dual-mode phone is a phone which uses more than one technique for sending and receiving voice and data. . *See, e.g., Nokia 6136 Dual Mode Phone*., TMCNET, Feb. 13, 2006, http://blog.tmcnet.com/blog/tom-keating/mobile-phones/nokia-6136-dual-mode-phone.asp.

[161] T-Mobile, Hot Spot at Home, http://www.theonlyphoneyouneed.com/ (last visited May 12, 2008); *See also* Jacqui Cheng, *T-Mobile Readying Cell-to-WiFI* Service, ARS TECHNICA, Sept. 7, 2006, http://arstechnica.com/news.ars/post/20060907-7689.html.

[162] Nicole Fabris, *Dual-Mode Cellular/Wi-Fi Handset Shipments to Top 300 Million in 2011, But Femtocells Are the Wildcard*, ABI RESEARCH, Sept. 20, 2006. (http://www.abiresearch.com/abiprdisplay.jsp?pressid=727)

[163] Jacqui Cheng, *T-Mobile Readying Cell-to-WiFI* Service, ARS TECHNICA, Sept. 7, 2006, http://arstechnica.com/news.ars/post/20060907-7689.html.

[164] *Wifi-cellular gadgets a go go*, TELECOM.COMS, June 14, 2007, http://www.telecoms.com/itmgcontent/tcoms/news/articles/20017432766.html?1=1&mp_articleid=2

almost half of US early adopters want their phones to include WLAN capability when they next upgrade."[165]

Wi-Fi enabled handsets, however, may have to compete with the upcoming opportunity of femtocells (or access point base stations),[166] the new, small cellular base stations designed for use in residential or corporate environments.[167] Like Wi-Fi access points they connect to the customer's own broadband connection. Their lure is of greater network efficiency, reduced churn, better in-building wireless coverage, and the abilities to shape subscriber data usage patterns and to build platforms upon which fixed-mobile convergence services can be realized – essentially the same reasons for using Wi-Fi-enabled handsets."[168] One article on the subject leads with the caption "Femtocell market to expand tenfold by 2008".[169] In April 2008, "Embarq is introducing the eGo, a DSL-based cordless phone that features such advanced features as visual voice mail and news flashes."[170]

6.7 Value characteristics of wireless services

Understanding the underlying demand characteristics of wireless services is important to understand the paradigm shift for universal service. This section briefly describes the key characteristics of wireless services, and how they affect the demand for connectivity and the importance of wireless to universal service. A more detailed analysis of the characteristics of wireless services and the degree to which they affect the demand for connectivity is beyond the scope of this paper.

Not surprisingly, the most obvious, and probably the most important, characteristic of wireless service is mobility. It is not a coincidence that the most generic name for wireless voice services is "mobile." Mobility is the primary factor that has provided the impetus for the change in perceptions about connectivity. Individuals, rather than locations, demand (in the economic sense) connection to a network.

The value of mobility includes other value characteristics that are derived from mobility. These include factors such as safety/security derived from being able to make emergency calls from any location.[171] The FCC's Consumer Facts page states "For many

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0017432766&mp_pubcode=MTEL&mp_channelid=30000000378&Marlinsource=V2autoMatt&ST=OEM&MarlinViewType=ARTICLEVIEW&siteid=30000000461&from=M@T-SideNews.

[165] *Id.*

[166] *See, e.g.,* Press Release, 2Wire Raises the Bar on Fixed-Mobile Convergence by Integrating Femtocells into its Residential Gateways, Mar. 21, 2007, http://www.2wire.com/?p=95&pid=160.

[167] *See generally* FematoForum Home, http://www.femtoforum.org/index.html (last visited Jul. 31, 2007, (femtocell discussion forum).

[168] *Id.*

[169] CTIA Smartbrief, December 14, 2007.

[170] USTelecom dailyLead, April 8, 2008.

[171] Nate Poppino, *Removing the Leash: For Many, Cell Phones -- Alone -- Are the Way to Go*, TIMES-NEWS (Idaho), Jul. 29 2006, *available at* (http://www.redorbit.com/news/technology/593510/removing_the_leash_for_many_cell_phones__a

Americans, the ability to call 911 for help in an emergency is one of the main reasons they own a wireless phone."[172] To that end, the FCC has mandated that wireless providers insure that at least 95% of their subscribers have "location-capable handsets" that allow 911 operators to determine a caller's precise location; wireless provider Alltel has stated that it is on schedule to achieve this goal by June 30, 2007.[173]

While mobility is critical, it is not the only characteristic that determines the demand for wireless services. Other factors that are apparently important to some customers include: 1) wider local calling scopes; 2) more responsive customer service (e.g., same-day initiation of service); 3) in-network (intra-network) calling options for customers to place free calls to other people on the same network, and[174] 4) availability of text messaging and mobile instant messaging; 5) availability of internet access; 6) voice recognition and hands-free capabilities, 7) and other features such as cameras, calendars, calculator, watch, games, global positioning, (as an example, more than two-thirds of those in the U.K now use mobile phones to perform the function of an alarm clock);[175] and 8) of course demand is determined in large part by prices (with consistently falling mobile prices vis-à-vis local land land prices*).*

Moreover, demand may be greater with the combination of the array of now-typical mobile phone capabilities as well as newer capabilities on a single platform and/or device. The degree of success of devises like Apple's iPhone[176] will provide an indication of the value customers place on increasingly combined-capability devises, at least at current prices. As the FCC notes, "The iPhone can seamlessly switch from an EDGE to a Wi-Fi connection, and will automatically display a list of new Wi-Fi networks in range as the user moves to a new location."[177]

Another part of recent appeal of wireless services is the fall in wireless prices over time, in particular, compared to wireline local telephone prices. Measures of price

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lone_/index.html?source=r_technology) ("While she had no solid figures, Jones said she would guess about 65 percent of 911 calls that come through her dispatch are from cell phones"). *See also* FCC, WIRELESS 911 (http://www.fcc.gov/cgb/consumerfacts/wireless911srvc.html)

[172] FCC, WIRELESS 911 (http://www.fcc.gov/cgb/consumerfacts/wireless911srvc.html)

[173] *Alltel Expects To Meet Location-Capable Phone Goal This Month*, TELECOM A.M., Jun. 6, 2007

[174] T A*re Americans Cutting The Cord?*, TELECOMWEB NEWS DIGEST, Sept. 12, 2005, http://www.accessmylibrary.com/coms2/summary_0286-9609806_ITM.

[175] CELLULAR NEWS, BRITS DITCHING THE ALARM CLOCK - FOR A MOBILE PHONE TO WAKE THEM UP (posted May 14, 2008) http://www.cellular-news.com/story/31147.php

[176] *See iPhone to Land June 29*, TELECOMS.COM, Jun. 4, 2007, http://www.telecoms.com/itmgcontent/tcoms/require-reg.html?prevurl=/tcoms/news/articles/20017429559.html&artid=20017429559&producttype=news&from=M@T-TopNews ("A series of adverts that aired on US TV on Sunday night [June 3, 2007] revealed that the long awaited Apple iPhone is due to be released on June 29.") *See also* Apple, iPhone, http://www.apple.com/iphone/; John Markoff, *With the iPhone, Steven Jobs casts a spell on the American consumer*, INT'L HERALD TRIB., Jun. 3, 2007, *available at* http://www.iht.com/articles/2007/06/03/business/wireless04.php.

[177] 12th CMRS Report, at Para. 165, *citing* Walter S. Mossberg & Katherine Boehret, *Testing Out the iPhone*, WALL STREET J., Jun. 27, 2007, at D1.

changes in mobile are somewhat troublesome since average bundled minutes are generally rising and new phones tend to have additional features and functions. [178] The FCC's Annual CMRS Report provides a variety of sources estimating price changes over time.[179] The comparison between mobile and local land-line CPIs over time is striking. Mobile has negative CPI values for year (1997-2006), including three years with double-digit declines, while local land-line telephony has and positive CPI for each year. The FCC's table of price reductions (as measured by average revenue per minute), shown below, displays a relatively consistent trend over the last decade.[180]

Table 14: Average Revenue Per Minute

	Average Local Monthly Bill	Minutes of Use Per Month	Average Revenue Per Minute	Annual Change in Overall RPM	Wireless Data Revenue as Percent of Total Service Revenues	Average Local Monthly Bill (excl. Data Revenues)	Average Revenue Per Voice Minute	Annual Change in Voice RPM
1993	$61.49	140	$0.44		n/a	$61.49	$0.44	
1994	$56.21	119	$0.47	8%	n/a	$56.21	$0.47	8%
1995	$51.00	119	$0.43	-9%	n/a	$51.00	$0.43	-9%
1996	$47.70	125	$0.38	-11%	n/a	$47.70	$0.38	-11%
1997	$42.78	117	$0.37	-4%	n/a	$42.78	$0.37	-4%
1998	$39.43	136	$0.29	-21%	n/a	$39.43	$0.29	-21%
1999	$41.24	185	$0.22	-23%	0.2%	$41.16	$0.22	-23%
2000	$45.27	255	$0.18	-20%	0.4%	$45.09	$0.18	-21%
2001	$47.37	380	$0.12	-30%	0.9%	$46.94	$0.12	-30%
2002	$48.40	427	$0.11	-9%	1.2%	$47.82	$0.11	-9%
2003	$49.91	507	$0.10	-13%	2.5%	$48.66	$0.10	-14%
2004	$50.64	584	$0.09	-12%	4.8%	$48.21	$0.08	-14%
2005	$49.98	708	$0.07	-19%	8.3%	$45.83	$0.06	-22%
2006	$50.56	714	$0.07	0%	13.5%	$43.73	$0.06	-5%

Average revenue per minute in the United States currently sits at an all-time low of $.04.[181] Moreover, such average revenue per minute measures do not capture the value to consumers of additional vertical features over time (e.g., mobile internet, picture message capability). During the time period December 1997 to December 2006, the wireline local telephone service CPI rose 31.1%.[182] A CTIA filing with the FCC noted the comparison of U.S. mobile prices with those of other countries:[183]

> American carriers receive the lowest revenue per minute of use of all the OECD

[178] 12th CMRS REPORT , Para. 198, tbl. 13,

[179] 12th CMRS REPORT

[180] 12th CMRS REPORT at Appendix A, table 10.

[181] CTIA, Written Ex Parte Communication In re: Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Service, WT Docket No. 07-71, at 5 (2008), *available at* http://files.ctia.org/pdf/080108_US-OECD_10_Comparison_Ex_Parte.pdf.

[182] *Id*. at Tbl. 13.

[183] CTIA ex parte filing with the FCC, January 18, 2008, http://files.ctia.org/pdf/080108_US-OECD_10_Comparison_Ex_Parte.pdf. (*citing* Glen Campbell, et al., "Global Wireless Matrix 2Q07," Merrill Lynch, Oct. 4, 2007, at Table 1 ("*Merrill Lynch*").

> countries. On average, a U.S. wireless carrier derives just $0.04 of revenue for each minute used on its network.5 By contrast, in other OECD countries, carriers are paid up to six times as much for each minute of consumer use (Japan, $0.25 per minute), with the closest country being two-and-a-half times as much (Canada, $0.10 per minute).

6.8 Local v. long distance distinctions are blurring

The traditional distinction between local and long-distance calling was largely driven by two historical wireline factors. First, there was a long-standing policy of having long distance telecommunications service help to cross-subsidize wireline local service.[184] However, at the federal level these subsidies have generally declined over time.[185] Second, wireline costs of long distance service were originally significantly higher than local service.[186] Transmission costs and switching costs were significantly higher decades ago.[187] Today, fiber-optics transmission facilities and digital switching have drastically narrowed the gap between local and long distance costs. Wireless providers generally make no distinction between "local" and "long distance" services. Today, many wireless providers offer bundles of minutes that include local and long-distance calls.[188]

Many years ago, wireline providers began eliminating the distance component to long distance service. Prices for long distance services have generally fallen, vis-à-vis local prices since 1982.[189] For example, the FCC reported that average revenues per interstate call minute was $.33 in 1983, but had fallen to $.06 by 2004.[190] Consider the

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[184] *See, e.g.*, Steve Parsons, *Cross-Subsidization in Telecommunications*, 13 J. OF REG. ECON. 157-182 (1998), *available at* http://www.parsonsecon.com/parsonsecon/publications.html (surveying the economics literature on this topic); THOMAS G. KRATTENMAKER, TELECOMMUJNICNS LAW & POLICY 349 (2nd ed, 1998.).

[185] FCC, TRENDS IN TELEPHONE SERVICE 59 (2007), table 1.2 (Showing a total charge per conversation minute for interstate switched access rates dropping from $.1726 in 1984 to $.0163 in 2007. However since these are weighted by minute the value will largely reflect lower prices for large ILECs rather than the higher prices for small ILECs). *Available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270407A1.pdf.

[186] This is true since long distance costs are dominated by the costs of electronics (which have fallen rapidly over time) while the costs of local service are dominated by capitalized labor (for placement). *See also*, FRANCES CARINCROSS, THE DEATH OF DISTANCE: HOW THE COMMUNICATIONS REVOLUTION IS CHANGING OUR LIVES (1997).

[187] Again, these costs are dominated by electronics and therefore continue to decline.

[188] *See* the website of virtually any wireless provider.

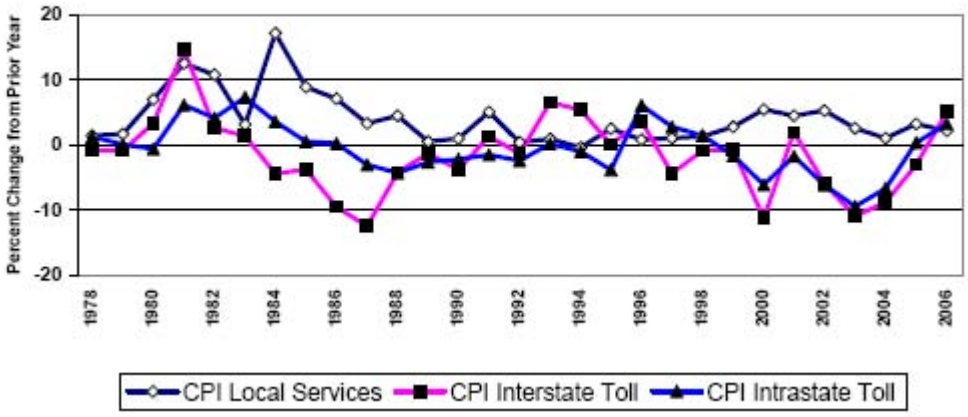
[189] *See*, the most recent FCC, STATISTICS OF COMMUNICATIONS COMMON CARRIERS (2004/2005 edition), table 5.10, a*vailable at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-262086A1.pdf. ; FCC, UNIVERSAL SERVICE MONITORING REPORT at section 7 (2007), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-279226A1.pdf.

[190] FCC, TRENDS IN TELEPHONE SERVICE (2007), table 13.4, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270407A1.pdf.

prices for the period since 1978:[191]

Chart 7.3

CPI Telephone Service Price Indices



Distance-sensitive long distance pricing gave way to a single per minute charge for long distance calling.[192]. Customers tended to prefer the simplicity and certainty of a single charge for calling [193]During the same time period, prices of "long distance" calling also fell significantly. Even in the wireline environment, customers were changing their concepts of calling to one in which usage was simply usage. Indeed, wireline providers are increasingly marketing bundles of local and unlimited long distance calling.[194] In this instance, the wireless paradigm, where usage is usage, regardless of the distance of the call, is now driving marketing plans as providers strive to meet the demands of customers.

6.9 Predominance of cordless phones and other unlicensed wireless devices as changed perceptions of connectivity

[191] FCC UNIVERSAL SERVICE MONITORING REPORT (December 2007) section 7, chart 7.3, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-279226A1.pdf.

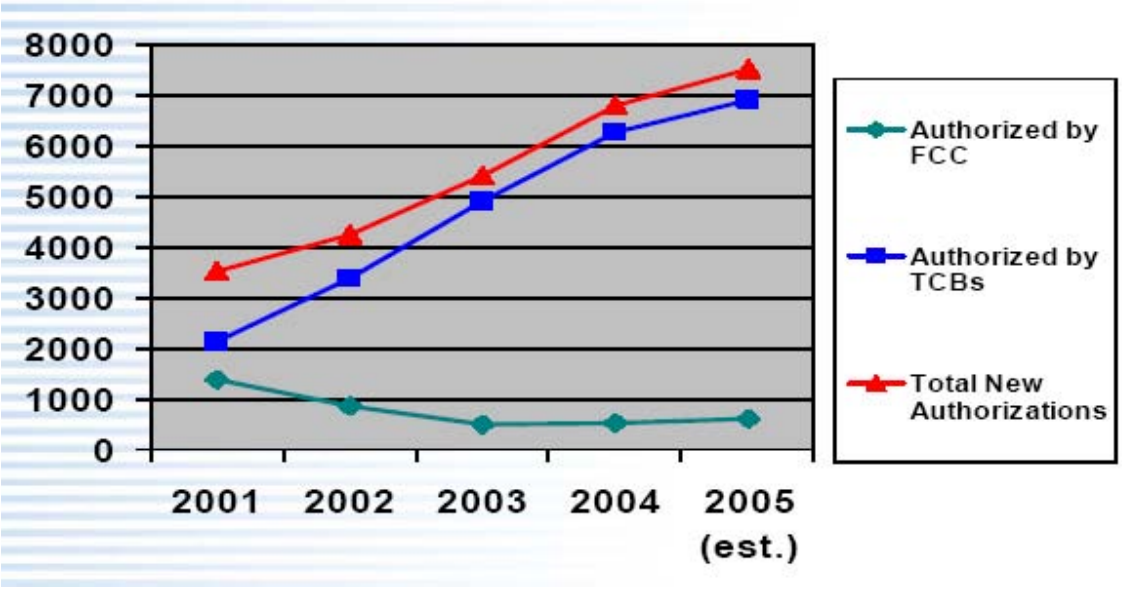
[192] See FRANCES CARINCROSS, THE DEATH OF DISTANCE: HOW THE COMMUNICATIONS REVOLUTION IS CHANGING OUR LIVES (1997)

[193] *C.f.*, Wikipedia, Long Distance, http://en.wikipedia.org/wiki/Long_distance.

[194] *See SBC Goes Unlimited*, DIGEST, Apr. 3, 2003, http://www.thedigest.com/more/151/151-006.html. *See also*, Jim Duffy, *RBOCs gain approval, launch long-distance services*, NETWORK WORLD FUSION, Apr. 16, 2003, http://www.nwfusion.com/edge/news/2003/0416rbocs.html ("Consumers can order an unlimited calling plan, Verizon Freedom, which includes all direct-dialed domestic calls -- local, regional and long-distance -- as well as calls to Canada and U.S. territories. The package includes voice mail, caller ID, call waiting, three-way calling and speed dialing of eight numbers. The monthly cost for Verizon Freedom is $49.95, plus state and local taxes.").

The growth and acceptance of wireless devices in general (many of them unlicensed) has changed perceptions of connectivity.[195] "One thing is certain, unlicensed wireless devices have become pervasive, reaching nearly every household in the US. The Consumer Electronics Association estimates that there is an installed base of more than 348.23 million Part 15 consumer electronics devices; that is, more than one for every US citizen."[196] By 2002 there were 12,723 general unlicensed devices (Part 15C, including authorizations for changes to existing devices). A 2003 study (presumably with older data) shows that cordless phone penetration had reached approximately 81% with 41% penetration for garage door openers, and lower levels for other devices.[197]

Other wireless devices include: keyless entry systems, home security systems, walky-talkies (nor FRS), wireless routers, remote control devices (e.g., toys, T.Vs), radio frequency identification (RFID), motion activated sensors (e.g., lights), wireless dog fences, EZ-Pass (freeway sensors); SpeedPass (wireless detection and payment systems at e.g., gas stations); Wi-Fi, W-LANs, wireless PBXs and other network communications devices; wireless telemetry (e.g., wireless heart monitors); distance sensors (e.g., car bumpers); ultra wideband technologies (e.g., ground penetrating radar, Authorizations of Part 15 devices continues to rise, as seen below.[198]



[195] *See generally*, KENNETH CARTER, AHMED LAHJOUJI & NEAL MCNEIL, OFFICE OF STRATEGIC PLANNING AND POLICY ANALYSIS, FCC, UNLICENSED AND UNSHACKLED: A JOINT OSP-OET WHITE PAPER ON UNLICENSED DEVICES AND THEIR REGULATORY ISSUES, (2003), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-234741A1.pdf.

[196] *Id* at 22.

[197] *Id.*

[198] GEORGE TANNAHILL, OFFICE OF ENGINEERING AND TECHNOLOGY LABORATORY DIVISION, FCC, INTRODUCTION TO FCC RULES AND INTRODUCTION TO FCC RULES AND EQUIPMENT AUTHORIZATION PROGRAM EQUIPMENT AUTHORIZATION PROGRAM OCTOBER 2005 TCB WORKSHOP. *available at* http://www.fcc.gov/oet/ea/presentations/files/oct05/Intro_to_FCC_Policy_GT.pdf.

In total the growth in and ubiquity of these devices has changed perceptions of connectivity. The cordless phone in particular has been influential; it has a long history and provides mobility within homes and businesses.[199] The latest wave of cordless phones are VoIP cordless phones.[200]

6.10 The Importance of Data and High Speed Connections to Concepts of Connectivity

6.10.1 Increased importance of "data" to connectivity

Throughout the great majority of the 20th century, voice communications dominated communications and notions of connectivity. However in the new millennium customer perceptions (both business and residential) of the importance of connectivity are increasingly focused on data.

6.10.2 Growth in internet subscription and usage has changed perceptions of connectivity

Internetworldstats shows 69.9% of the U.S. population uses the internet (compared to 14.1% for the rest of the world), a 124.4% growth in the U.S. since 2000.[201] Internet usage for the age group 18-49 is approximately 83%; and for the highest income classifications it is 94%.[202] A 2004 study shows "the average Internet user spends 3 hours per day online, almost double the 1.7 hours the average respondent spends watching television."[203] This study found that approximately one/third of all on-line time occurs at work.

Another study finds: [204]

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[199] Jim Charny, *E-mail to land in cordless phones*, CNET NEWS, Apr. 12, 2002, http://news.com.com/2100-1033-882085.html.

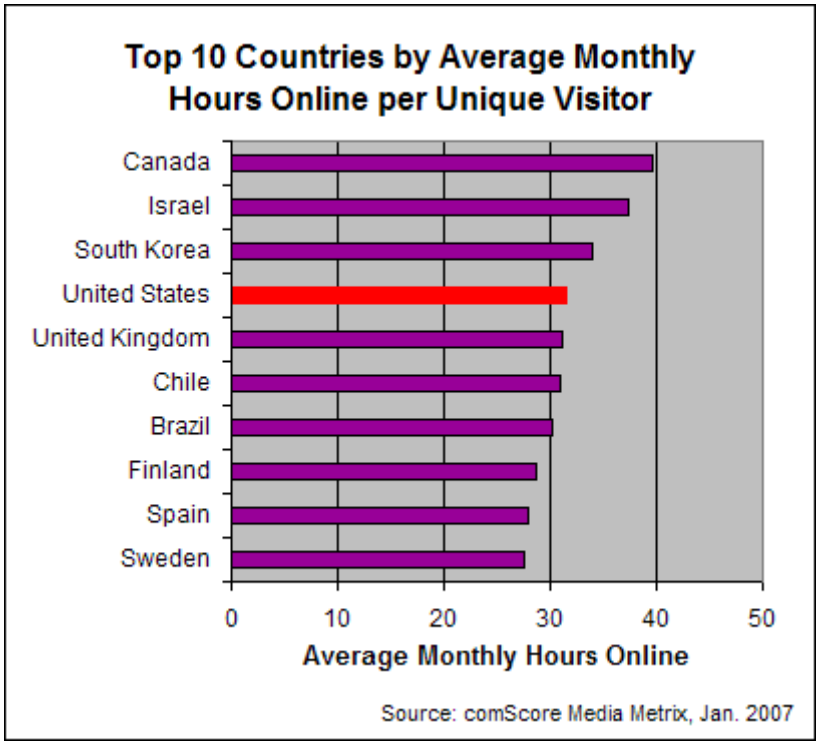
[200] *See, e.g., Linksys Debuts Cordless Skype VOIP Handset,* DEVICE FORGE, Oct. 11, 2005, http://www.deviceforge.com/news/NS4571213183.html; *New Series of Siemens IP Phones Aimed at Non-PC Literate and SMB Market*, SDA ASIA, Jun. 8, 2007, http://www.sda-asia.com/sda/features/psecom,id,1229,nodeid,1,_language,Singapore.html.

[201] Internet World Stats, North American Internet Usage Stats and Population Statistics, http://www.internetworldstats.com/stats14.htm (last visited Jun. 6, 2007).

[202] The Content Wrangler, American Internet Usage Statistics, http://thecontentwrangler.com/article/american_internet_usage_statistics/ (last visited Jun. 6, 2007).

[203] Rob McGann, *Internet Edges Out Family Time More Than TV Time*, CLICKZ STATS, Jan. 5, 2005, http://www.clickz.com/showPage.html?page=3455061.

[204] Website Optimization, US Broadband Penetration Breaks 80% Among Active Users, http://www.websiteoptimization.com/bw/0703/ (last visited Jun. 6, 2007).



6.10.3 Growth in broadband has changed perceptions of connectivity

Along with the growth in internet subscription and internet usage is the very rapid rates of growth in broadband connections. One indication of the importance of broadband is seen in a recent article evaluating the EC's policy for state aid for broadband, stating,

> "The European Commission considers widespread broadband coverage as crucial for fostering growth and employment in the European Union. … The Commission explicitly recognises the role state aid has to play in achieving widespread broadband access in the EU, in particular in rural and remote areas, and its decisions provide guidance on how to design public support for broadband projects that are compatible with the state aid rules."[205]

A Leichtman Research report indicates that: "[b]roadband subscribership jumped 20% the past year, [and that] among U.S. homes with Internet service 72% had high-speed access as of March. In 2006, 60% of homes subscribed."[206] Another study found even higher levels of broadband penetration; "US broadband penetration grew to 88.39% in February 2008. Narrowband users connecting at 56Kbps or less now make up 11.61%

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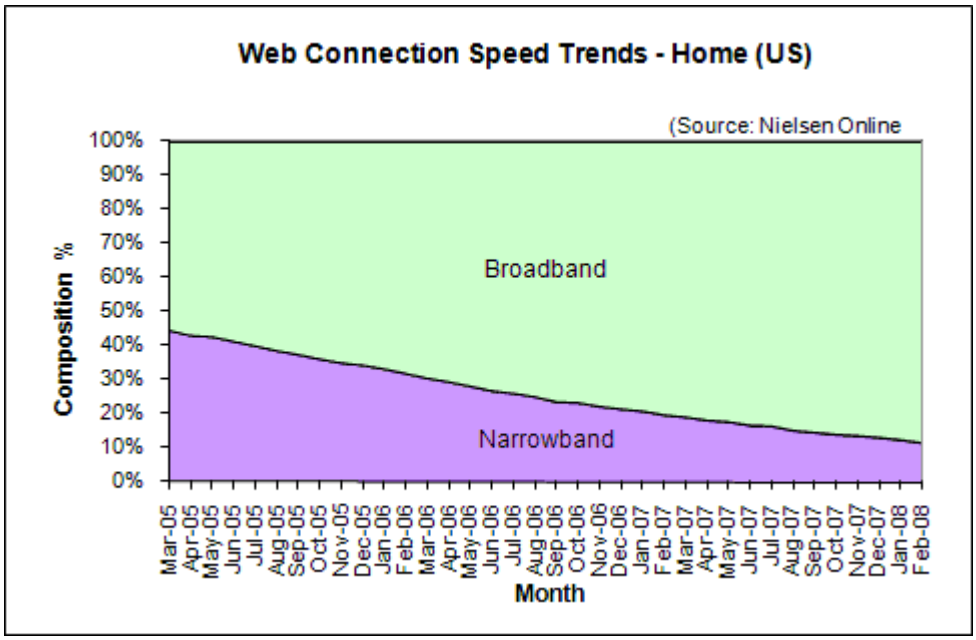
[205] Paris Anestis, Stephen Mavroghenis & Eleftheria Psaraki, *Public funding of broadband services*, EUR. ANTITRUST REV. (2007), *available at* http://www.howrey.com/docs/Paris_Mavroghenis_Psaraki_11_EU_State_Aid.pdf.(citing Amol Sharma, *How Wi-Fi Can Extend T-Mobile's Range*, WALL ST. J., May 3, 2007, *available at* http://online.wsj.com/article/SB117815938377190497.html?mod=home_whats_news_us)

[206] Report: U.S. Broadband Subscriptions Jumped 20% Last Year, TELECOM AM, Jun. 8, 2007.

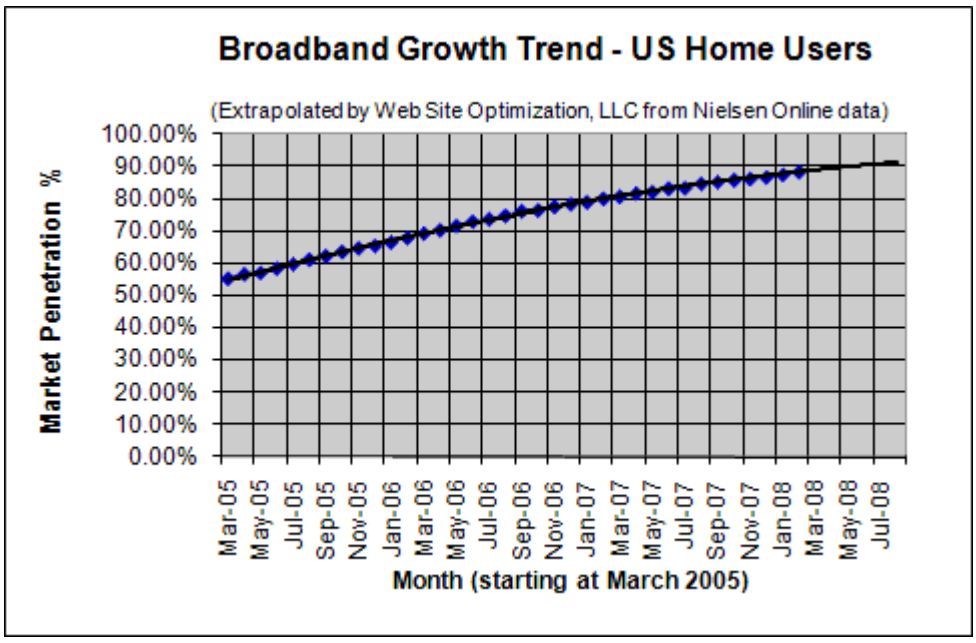
of active Internet users, down 0.90 percentage points from 12.51% in January 2008 (see Figure 2)."[207]



The figure below focuses on the broadband segment, including a short-term forecast.[208]

[207] Website Optimization, Survey: Europe to Pass US in Wi-Fi Use - FCC Redefines Broadband - US Broadband Penetration Jumps to 88.4% among Active Internet Users - March 2008 Bandwidth Report, http://www.websiteoptimization.com/bw/0803/) (last visited May 12, 2008).

[208] *Id.*

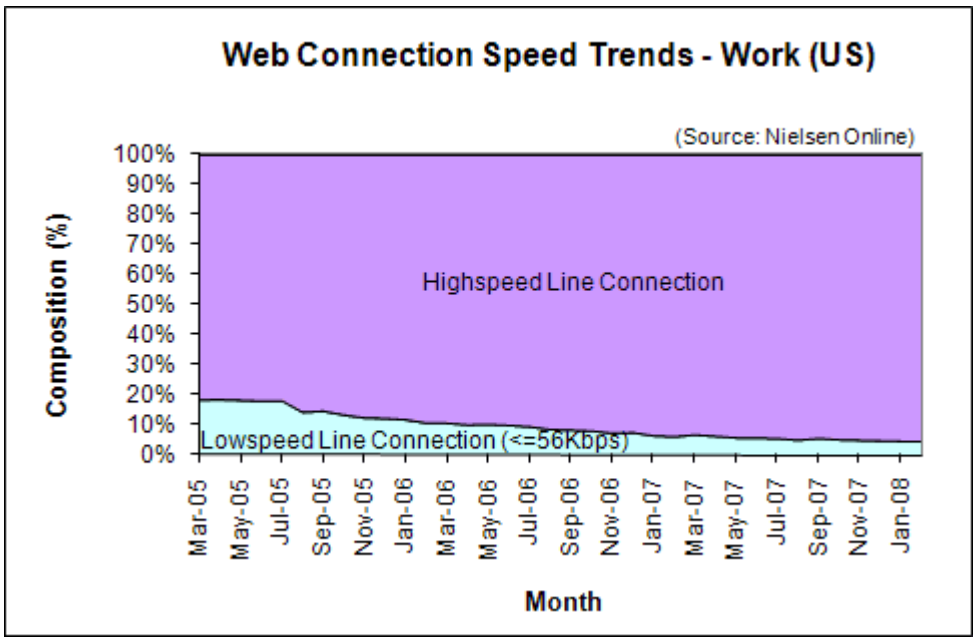


One forecast also indicates greater speeds in the future, finding that "[b]y 2010, about 75% of U.S. households will have broadband service, and about 12% of households will subscribe to very high-speed broadband (at least 24 Mb/s)." [209]

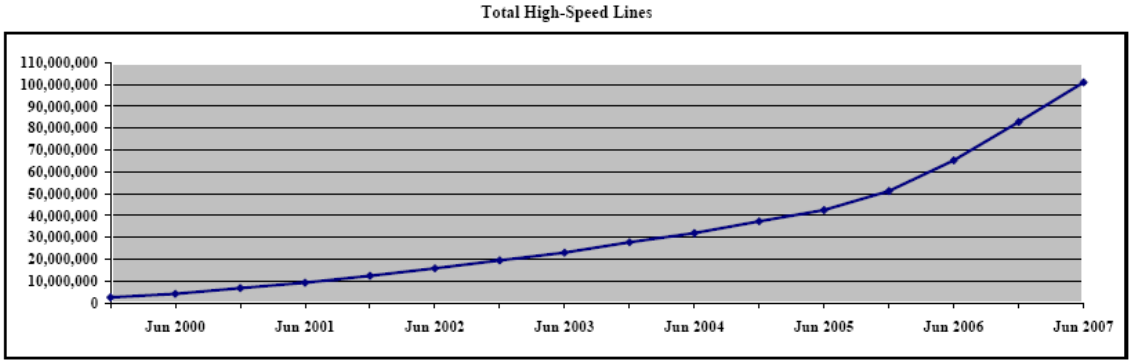
Broadband penetration is even higher in the workplace. "As of February 2008, 95.3% of US workers connected to the Internet with broadband," as illustrated by the graph below.[210]

[209] LAWRENCE K. VANSTON, & RAY L. HODGES, TRANSFORMING THE LOCAL EXCHANGE NETWORK: THIRD EDITION (2006), *available at* http://www.tfi.com/pubs/r/g02006_tlen-fig2.html.

[210] Website Optimization, Survey: Europe to Pass US in Wi-Fi Use - FCC Redefines Broadband - US Broadband Penetration Jumps to 88.4% among Active Internet Users - March 2008 Bandwidth Report, http://www.websiteoptimization.com/bw/0803/) (last visited May 12, 2008).



As FCC data shows, wireless broadband connectivity is growing at an astonishing rate.[211] Over 35 million lines or approximately 35% of total high-speed lines in June 2007 were mobile wireless (36.4% counting satellite & fixed wireless, in the graph below).[212]



There has been rapid growth in mobile wireless high-speed lines, as seen below.[213]

[211] FCC, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2007 (2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280906A1.pdf.

[212] *Id.*

[213] FCC, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2007 (REL, MARCH 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280906A1.pdf

Table 1
High-Speed Lines [1]
(Over 200 kbps in at least one direction)

Technology [2]	2000	2001	2002	2003	2004	2005		2006		2007
	Jun	Jun	Jun	Jun	Jun	Jun	Dec	Jun	Dec	Jun
ADSL	951,583	2,693,834	5,101,493	7,675,114	11,398,199	16,316,309	19,515,483	22,584,255	25,412,883	27,516,171
SDSL and Traditional Wireline	758,594	1,088,066	1,186,680	1,215,713	1,407,121	898,468	878,973	948,134	1,030,698	1,028,654
SDSL	-	-	-	-	-	411,731	368,782	337,412	344,759	319,932
Traditional Wireline	-	-	-	-	-	486,737	510,191	610,722	685,939	708,722
Cable Modem	2,284,491	5,184,141	9,172,895	13,684,225	18,592,636	24,017,442	26,558,206	29,174,494	31,981,705	34,408,553
Fiber [3]	46,635	81,248	105,991	111,386	130,928	315,651	448,257	685,823	1,035,677	1,402,652
Satellite and Wireless	65,615	194,707	220,588	309,006	421,690	965,068	3,812,655	11,872,998	23,344,106	36,560,197
Satellite	-	-	-	-	-	376,837	426,928	495,365	571,980	668,803
Fixed Wireless	-	-	-	-	-	208,695	257,431	361,113	484,277	586,141
Mobile Wireless	-	-	-	-	-	379,536	3,128,296	11,016,520	22,287,849	35,305,253
Power Line and Other	-	-	-	-	-	4,872	4,571	5,208	4,776	5,420
Total Lines	4,106,918	9,241,996	15,787,647	22,995,444	31,950,574	42,517,810	51,218,145	65,270,912	82,809,845	100,921,647

For data through December 2004, only those providers with at least 250 lines per state were required to file.
Some historical data have been revised. See additional notes following Chart 10.

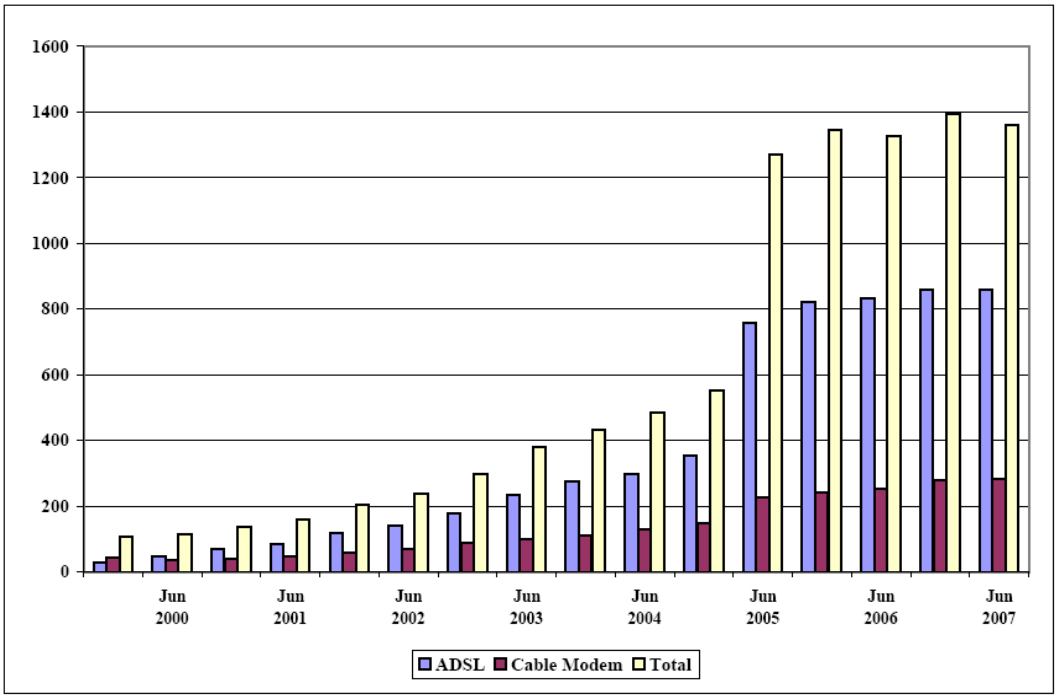
Note that the early data (2000-2003) in the graph above is annual, rather than semi-annual; therefore the recent growth is visually somewhat understated. Also, since the graph above combines mobile wireless with other technology types, the graph understates the growth in mobile wireless. In June 2005, there were less than 380,000 mobile wireless lines; this means that over a one-year time period, wireless mobile connections grew by approximately 2,900%.[214]

The chart below not only shows the growth in high-speed service providers over time, it shows the change in mix of providers (with more rapid growth in ADSL providers in June 2004):[215]

[214] *Id*, table 1.

[215] *Id*, chart 11.

Chart 11
Historical Number of Reporting Providers of High-Speed Lines by Technology



One concern is that higher broadband growth in urban areas will contribute to a digital divide.[216] A May 2006 report released by the Government Accountability Office (GAO) found that 17% of rural households subscribe to broadband, as opposed to 28% of suburban and 29% of urban households.[217]

Wireless technologies are playing an important role in the growth of broadband, and moving the U.S. towards ubiquitous broadband coverage. This is particularly true for broadband in rural areas where longer distances and lower density make land-line broadband alternatives costly. A study of the broadband gap in Wyoming by CostQuest illustrated that wireless solutions were generally the most cost effective to fill the broadband gap.[218] "Based on the uniform light green, it is apparent that Fixed Wireless is

[216] *See, generally,* LENNARD G. KRUGER & ANGELE E. GILROY, CONGRESSIONAL RESEARCH SERVICE, BROADBAND INTERNET ACCESS AND THE DIGITAL DIVIDE: FEDERAL ASSISTANCE PROGRAMS at Introduction (2008), *available at* http://www.nationalaglawcenter.org/assets/crs/RL30719.pdf.

[217] U.S. Government Accountability Office, Broadband Deployment is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas, GAO-06-426, May 2006, p. 12.

[218] JAMES STEGEMAN, STEVE PARSONS, & MIKE WILSON, PROPOSAL FOR A COMPETITIVE AND EFFICIENT UNIVERSAL SERVICE HIGH-COST APPROACH (2007), *submitted to* High-Cost Universal Service Support, 72 Fed. Reg. 28936 (May 23, 2007)(codified at 47 C.F.R. 54). *See also*, Cost Quest Associates, QBits, http://www.costquest.com/costquest/qbits.aspx (last visited May 13, 2008).

more efficient based on land area [but not numbers of customers] and that it offers economies in the less dense portions of the state."[219]

A recent study by CostQuest focused on the gap in wireless broadband coverage. This study found:[220]

> 1) Approximately 23. 23.2 Million U.S. residents currently do not have access to 3G mobile broadband service at their primary place of residence.
> 2) We estimate that approximately 42% of road miles % in the United States do not have access to 3G mobile broadband service.
> 3) The estimated investment needed to build out infrastructure to facilitate mobile broadband service ubiquitously is approximately $22 billion.

6.11 Growth and convergence in smart phones, PDAs, text messaging and mobile instant messaging is changing perceptions of connectivity

Personal digital assistant ("PDA"),[221] is a term that, while once popular, seems to be losing favor. "Convergence continues between smartphones, which are application-enabled, voice-centric cellular telephones, and voice-enabled, data-centric PDA's. As smartphones become more sophisticated, with more sophisticated applications and services available over them, they will likely start to encroach on the market for PDA's, such as RIM's BlackBerry."[222] Moreover, the entry of market participants like Google with open-source based smartphones signals the potential for new forms of competition.[223] Between 2006 and 2007, U.S. mobile internet usage grew three-fold, tracking similar results in the U.K. and Asia.[224] Because of convergence, it is increasingly difficult to determine whether PDA-like functions are driving expanded use of mobile phones, or whether the ubiquitous use of mobile handsets is expanding PDA-like functions. This expanded use and convergence is made possible in part via common operating systems (MS Widows).

Text messaging[225] is growing in importance. In the U.S., "As of July 2006, over 10 billion text messages are sent every month – and that number has grown by 250% each

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[219] *Id.*

[220] CostQuest Associates, U.S. Ubiquitous Mobility Study: Identification of and Estimated Initial Investments to Deploy Third Generation Mobile Broadband Networks in Unserved and Underserved Areas. *Available at* http://www.costquest.com/costquest/docs/UbiquitousMobileBroadband_CostQuest_CTIA.pdf

[221] A PDA is a lightweight, handheld computer, typically employing a touch-sensitive screen rather than a keyboard, generally used for storing information such as addresses or schedules. Many PDAs include handwriting recognition software, some support voice recognition, and some have an internal cell phone and modem to link with other computers or networks. AMERICAN HERITAGE SCIENCE DICTIONARY (2007).

[222] INDUSTRY CANADA, HANDSETS, http://strategis.ic.gc.ca/epic/site/ict-tic.nsf/en/it07834e.html (last visited Jun. 6, 2007).

[223] Alan Sipress, *Google Goes Mobile*, WASHINGTON POST, Sept. 14, 2006, at Page D01, *available at* http://www.washingtonpost.com/wp-dyn/content/article/2006/09/13/AR2006091301972.html.

[224] *U.S. Mobile Web Usage Said to Triple in Past Year*, TELECOM A.M., Jun. 6, 2007.

[225] Text messaging (or texting) is the common term for the sending of short (160 characters or less) text messages, using the Short Message Service, from mobile phones. It is available on most digital

year for the last two years."[226] These messages were sent, at that time, by nearly 70 million text users. The volume of text messages is project to grow to 80 billion a month in 2008.[227]

The closer-to-real-time Mobile Instant Messaging (MIM)[228] has also grown, but at a much slower rate than text messaging.[229] MIM has been also generated much smaller revenues than text messaging: $55 million v. $70 billion in 2005.[230] MIM may, however, benefit from adoption of the latest standard (IMPS V1.3)[231] and one group has forecasted revenues of $3.6 billion by 2009 for MIM.[232]

As with many technology trends, adoption rates for text messaging and MIM are higher for younger age groups,[233] which implies growing rates of penetration over time; that is at least until the next technology displaces (or converges with) current ones.

6.12 Growth of WiFi and WiMax

WiFi[234] and WiMax[235] deployment has grown rapidly over time. WiFi and WiMax are being deployed in cities, small towns and rural areas,[236] at truckstops and hotels, and

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mobile phones and some personal digital assistants with onboard wireless telecommunications. *See* FINN TROSBY, TELENOR NORDIC MOBILE, SMS, THE STRANGE DUCKLING OF GMS (2004), *available at* http://www.telenor.com/telektronikk/volumes/pdf/3.2004/Page_187-194.pdf.

[226] Cellsigns, Text Message Statistics, http://www.cellsigns.com/industry.shtml, (last visited Jun. 6, 2007).

[227] *Id.*

[228] *See* Mobilein.com, Mobile Instant Messaging, http://www.mobilein.com/MIM.htm (last visited May 16, 2008).

[229] *See* America Online, *Third Annual AOL Instant Messaging Trends Survey Discovers IM Has Taken Over the Desktop*, http://www.primenewswire.com/newsroom/news.html?d=89532 (last visited Jun. 6, 2007) (claiming a 19% annual growth 2005).

[230] Eric Sylvers, *Wireless: Medium and Messaging - Instant Versus Text*, INT'L HERALD TRIB., Jul. 10, 2006, *available at* http://www.iht.com/articles/2006/07/10/business/wireless11.php("according to In-Stat, though that is forecast to grow to more than $3.6 billion by 2009.")

[231] OPEN MOBILE ALLIANCE, OMA ENABLER RELEASES AND SPECIFICATIONS, http://www.openmobilealliance.org/release_program/imps_v1_3.html (last visited May 16, 2008).

[232] Eric Sylvers, *Wireless: Medium and Messaging - Instant Versus Text*, INT'L HERALD TRIB., Jul. 10, 2006, *available at* http://www.iht.com/articles/2006/07/10/business/wireless11.php ("according to In-Stat, though that is forecast to grow to more than $3.6 billion by 2009.")

[233] *See, e.g.*, HARRIS INTERACTIVE, WHAT'S WRONG WITH THIS PICTURE?, http://www.harrisinteractive.com/news/allnewsbydate.asp?NewsID=1067; Gene Koprowski, *Many Addicted to Cell Phone Use*, TECHNEWSWORLD, Apr. 13, 2006, http://www.technewsworld.com/story/49849.html.

[234] Short for "wireless fidelity," Wi-Fi is a term for certain types of wireless local area networks (WLAN) that use specifications conforming to IEEE 802.11b. British Library, About Us, http://www.bl.uk/about/strategic/glossary.html (last visited Aug. 2, 2007). WiFi has gained acceptance in many environments as an alternative to a wired LAN. *Id*.

[235] WiMAX is defined as Worldwide Interoperability for Microwave Access by the WiMAX Forum, formed in June 2001 to promote conformance and interoperability of the IEEE 802.16 standard,

at college campuses.[237] In May 2007, the mayor of Philadelphia announced plans to allow Earthlink to build a 135 square mile WiFi mesh network, with descriptions that it will make high speed access more affordable to its residents; Earthlink will finance, build and manage the network.[238] However, by May, 2008 Earthlink announced that due to low subscription rates it would terminate service in June 2008.[239] One article noted "A St. Louis network is the latest high-profile citywide Wi-Fi access project to hit insurmountable problems, joining defunct proposals in Chicago, Houston and San Francisco."[240]

Despite this, analysts are again touting Wi-Fi, stating, for example, "[d]espite the apparent collapse of Philadelphia's municipal Wi-Fi network, the deployment of local and regional wireless networks is increasing across the country, said panelists at Tuesday's W2i Digital Cities conference in Riverside, Calif. [241]

T-Mobile is planning a launch of cellphones that can roam on WiFi hotspots in homes and coffee shops, which will carry calls over the Web thus improving indoor reception, which will, in turn, save on monthly minutes.

Wi-Fi, and other high-speed deployment is not only in urban areas. For example, by the end of 2005 "In Maine, 86 percent of residents have access to broadband Internet. A year ago, Gov. John Baldacci announced an initiative called Connect ME which set a goal of high-speed Internet access for 90 percent of Mainers."[242]

"The number of cities and towns where networks are either in the planning, proposal, or discussion phase has almost quadrupled since February 2006 [by April 2007]. There are currently 164 planned deployments underway, with 115 of those having

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officially known as WirelessMAN. WiMAX Forum, FAQ, http://www.wimaxforum.org/technology/faq (last visited Aug. 2, 2007). WiMAX aims to provide wireless data over long distances, in a variety of different ways, from point to point links to full mobile cellular type access. *Id*.

[236] *See, e.g.*, Associated Press, *Wireless Cloud Covers Rural Oregon*, WIRED, Oct. 16, 2006, (http://www.wired.com/gadgets/wireless/news/2005/10/69234); Carlson Connected, Carlson Connected Wireless VoTDM, http://www.carlsonwireless.com/carlson_votdm.php (Last visited Jun. 13, 2007)(Vendor focusing on rural areas); *Rural Rescue Mesh-ion*, UNSTRUNG, Oct. 16, 2006, (http://www.unstrung.com/document.asp?doc_id=107523)

[237] Greg Slabodkin, *Wireless Takes American Campuses by Storm*, CAMPUS TECH., Jan. 2, 2007, (http://campustechnology.com/articles/41725/)

[238] Storm Jackson, *Earthlink to Build 135 Mile Philadelphia WiFi Network*, ASSOCIATED CONTENT, May 27, 2007, (http://www.associatedcontent.com/article/260298/earthlink_to_build_135_mile_philadelphia.html)

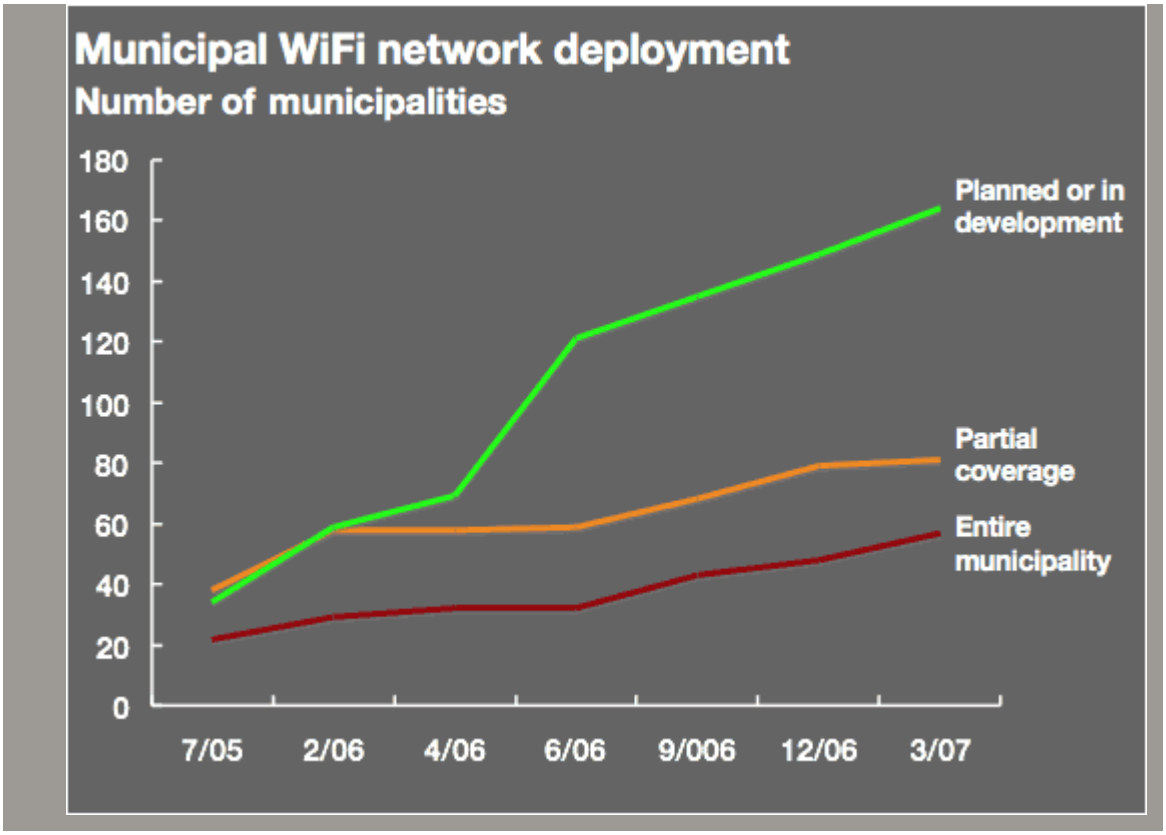
[239] Rachel Metz, *EarthLink to Pull the Plug on Wi-Fi in Philadelphia*, L.A. TIMES, May 14, 2008, *available at* http://www.latimes.com/business/la-fiw-earthlink14-2008may14,0,2022464.story; *See also* Stephen Lawson, *EarthLink Takes Hard Look at Muni Wi-Fi Unit*, INFOWORLD, Nov. 19, 2007, http://www.infoworld.com/article/07/11/19/EarthLink-takes-hard-look-at-muni-Wi-Fi_1.html

[240] *AT&T Pulls Out of Free Wi-Fi Deal in St. Louis*, TELECOM AM, Oct, 27, 2007.

[241] TELECOM AM, May 14, 2008.

[242] Wilson Ring, *Wireless Internet in Rural Areas is Incredible*, FREE PRESS, Jan. 2, 2007, http://www.freepress.net/news/13127.

moved to the construction or request for proposal (RFP) phase. Another 49 municipalities are considering WiFi networks with five of those close to issuing RFPs"[243]



The claim at the time was that "[t}]he upward trend on the graph above is likely to continue. The networks are useful public services, often offering free or low-cost, ad-supported services in addition to paid access plans."[244]

Even though Wi-Fi is currently convenient and inexpensive,[245] development of new technologies should make broadband even faster and more accessible in the near future. One example is the 802.16e wide-area wireless network; it provides greater range and

[243] Eric Bangeman, *Growth Spurt Continues for Munis*, ARS TECHNICA, Apr. 6, 2007, http://origin.arstechnica.com/news.ars/post/20070406-growth-spurt-continues-for-muni-wifi-with-no-end-in-sight.html.

[244] *Id.*

[245] *See, e.g.*, JWire, Find Wi-Fi Hotspots in the United States, http://www.jiwire.com/hot-spot-directory-browse-by-state.htm?provider_id=0&country_id=1 (Last visited Jun. 6, 2007)(showing massive availability and low cost of wi-fi access). Wi-Fi access is inexpensive, as the hardware is built into just about every notebook manufactured in the past three years and a growing number of corporate offices, airports, hotels, coffee bars, and municipalities provide connectivity virtually free. Leon Erlanger, *3G v. Wi-Fi Hotspots*, INFOWORLD, Apr. 24, 2006, http://www.infoworld.com/article/06/04/24/77293_17FE3gwimax_1.html.

performance -- from three to 10 miles, with speeds as fast as 30Mbps -- and replaces 802.11's contention-based architecture with one based on time slicing.[246] Although it will not likely be available until late 2007, many analysts predict that this particular version of the WiMAX standard will generate even more interest and volume—and hence economies of scale, and that WiMAX will embrace a range of profiles designed to address a wide variety of needs.[247]

Much of the deployment may come from private commercial ventures. One article stated: "This [2008] is the year Sprint will launch its Xohm mobile broadband service in select markets like Chicago, Baltimore and Washington, D.C. By end of 2008, Sprint expects to reach 100 million customers with its new ultra-fast mobile data service."[248] The popularity of WiFi and dual mode phones is sufficient to have at least one company selling T-shirts with WiFi hot spot detectors.[249] "Market analyst Juniper Research predicts that mobile WiMAX service could exceed 80 million subscribers by 2013, if the technology captures the 'YouTube generation.'"[250]

The exact technology format may still be as yet determined. "AT&T will pursue long term evolution (LTE) technology for its next-generation network, relegating WiMAX to niche markets, officials said at the Bell s Investor Day in San Antonio. In the meantime, AT&T aims to move away from old telco categories and focus on mobility and IP communications, said CEO Randall Stephenson."[251]

Certainly, WiFi deployment is not constrained to the U.S. In the U.K., BT and FON have joined forces to create a WiFI network where users will have access to more than 190,000 FON hotspots worldwide. [252] "Anyone joining will be able to use those FON hotspots across the world and all the new BT FON hotspots free of charge. Every person who agrees to share a small portion of their broadband connection, by opening up

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[246] *Id*.

[247] Pierre St.-Arnaud, *Minimizing the Risks of Wi-Max Deployment*, WIRELESS TELECOM MAG., May 25, 2007, http://www.wirtel.co.uk/article_eu_2005q1_005_srtelecom.htm.

[248] Michael Lev-Ram, *The Top 10 Wireless Trends for 2008*, FORTUNE, Dec. 31, 2007, *available at* http://techland.blogs.fortune.cnn.com/2007/12/31/the-top-10-wireless-trends-for-2008/.

[249] *ThinkGeek Selling T-shirts that Detect Wi-Fi Hot Spots*, CEA SMARTBRIEF, Mar. 14, 2008, http://www.smartbrief.com/news/cea/storyDetails.jsp?issueid=AA6AA4E3-86D8-4781-8185-E0F4F4D7749E&copyid=C80F5D62-8839-4150-B7B9-15210A26E7F5&lmcid=.

[250] *Analyst: Mobile WiMax Could Reach 80 Million Subscribers by 2013*, CTIA SMARTBRIEF, Dec. 12, 2007, http://www.smartbrief.com/news/ustelecom/storyDetails.jsp?issueid=A91BAD86-3899-48C0-AF25-999D73FF813A&copyid=7FCA05FC-0445-4E2C-B387-BA5408B1C92A&lmcid=1169538&brief=ustelecom.

[251] *AT&T Confirms LTE Direction, Spurns WiMax*, TELECOM AM, Dec. 12, 2007 ("LTE is the name given to a long-term project within the Third Generation Partnership Project to improve the Universal Mobile Telecommunications System mobile phone standard. AT&T will test and deploy LTE technology for its next-generation wireless network in 2010 or 2011, said John Stankey, AT&T Telecom Operations group president.")

[252] *BT and FON Launch the World's Largest Wi-Fi Community*, MOBILETECHNEWS, Oct. 4, 2007, http://www.mobiletechnews.com/info/2007/10/04/174824.html.

a separate, secure channel on their wireless router, will be able to share the connection of any other member."[253]

VII. Summary and Conclusion

The nature and history of wireline telecommunications led to notions of subscribership and universal service based on measures of connecting locations (homes and businesses). Explicit universal service funding was originally established in the U.S. as a wireline concept; wireless providers were virtually precluded from obtaining universal service funding. This contributed to a bias against wireless providers and a distortion in the technology choices by providers. Today, customer's concepts of connection to the network have shifted from connection to locations to connection to customers themselves. Customers now demand access across time and space.

Similarly, there is rapidly growing demand for broadband connections; and whether broadband internet access should explicitly be a part of the universal service concept is now a critical decision for the FCC (and legislators). Data generally supports the growing importance of mobility and broadband connections.

Sound universal service policy (like sound public policy in general) must be competitively neutral. That is, it must be neutral with respect to technology, and with respect to firms. Moreover, without competitive neutrality, consumer choice and sovereignty is subverted. Without competitive neutrality, the path forward will reflect the political/regulatory perception of universal service, not the underlying supply-side characteristics of the relevant technologies, nor the changing expectations of connectivity of Americans. The ultimate public policy mistake is to abandon the fundamental principle of competitive neutrality and pervert market results in order to achieve a politically expeditious result.

[253] *Id.*